

AVIATION WEEK

A McGRAW-HILL
PUBLICATION

September 17, 1956 50 cents

Special Reports:

- IATA Meeting
- Canada Air Show

BOEING KC-135 TANKER, 707 TRANSPORT



Helicopters Carry War to Algerian Rebels

the heartbeat of a self-locking nut



KAYLOCK
self-locking nuts

recorded to prove
'infinite reusability'

Kaylock Date witnessed the rigors of the most strenuous torque testing machine ever devised. We knew. We designed and custom-built special automatic equipment which conducts self-locking torque tests records the readings on continuous tapes: proves irrefutably the exceptional reliability of Kaylock Nuts.

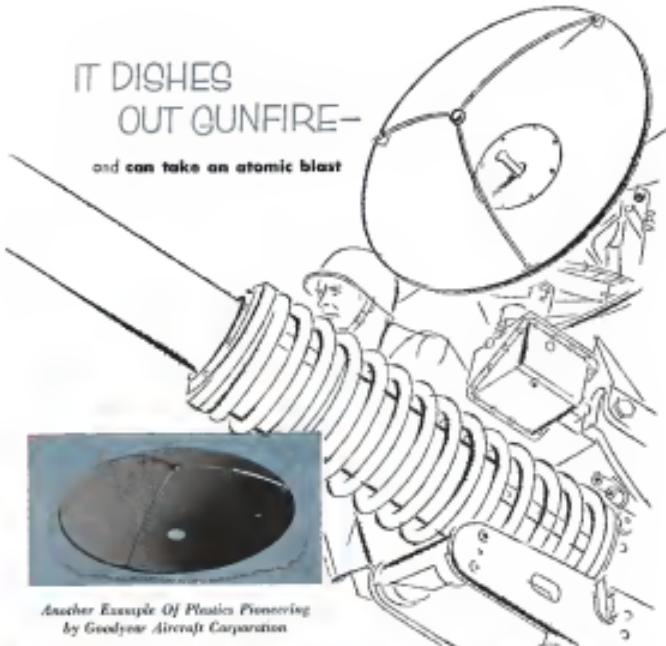
United States Patent Office Products and Services
MATERIALS FOR NAVY AIRCRAFT AIRCRAFT AND AIRSHIP



The Kaylock Company • Kaylock Division • Box 2081, Terminal Annex • Los Angeles 54, California • 1956
Canadian Distributor: Aermetics Aero Limited, Montreal

IT DISHES
OUT GUNFIRE—

and can take an atomic blast



Another Example Of Plastic Pioneering
by Goodyear Aircraft Corporation

This portable radar reflector will soon direct anti-aircraft fire upon a Navy vessel.

It weighs a mere 30 pounds—yet is able to withstand an atomic blast load of 22 tons.

How does it do it as well as dish it out?

The key lies in *integral design*—using a single-unit *die-molded* structural plastic to replace the host of detailed *assemblies* usually employed in such construction.

Developed by Goodyear Aircraft under contract with the Navy Bureau of Ordnance and Bell Telephone Laboratories, these plastic radar reflector dishes have proved they better than metal counterparts—and save.

They are lighter, stronger—eliminate complicated metal-work assembly—use two parts to replace many.

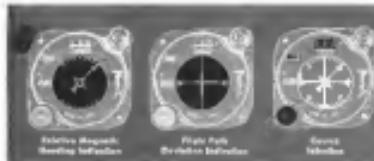
Already produced in diameters up to 72 inches, they are an excellent example of the plastic molding skills and techniques of Goodyear Aircraft Corporation.

Why not let such experience pave the way to eliminating difficult design and assembly problems facing you? By calling in Goodyear Aircraft, you will gain from this proved ability to follow such structures from metal, plastic and structural sandwich materials as combinations that pay off in strength-to-weight ratio, simplicity and exciting performance.

For information, write Goodyear Aircraft Corporation, Plants in Akron, Ohio, and Litchfield Park, Arizona.

They're Doing Big Things at **GOOD YEAR AIRCRAFT**

new **Bendix**
expanded range
OMNI-MAG



... combines 3 sources of VOR/ILS flight information on a single dial

Three vital VOR/ILS instruments in one that's the Bendix® Omni-Mag Indicator. It performs all the functions of a Relative Magnetic Heading Indicator, a Flight Path Deviation Indicator, and an Omni-Bearing Selector... and combines the information from each on a single, easy-to-read dial.

With this 3-in-1 "pictorial" feature, the *Scoutmaster* has found wide acceptance.



...smooths out ILS approaches... eliminates
need for bracketing

The Bendix Expanded Range Omni-Mag shows the pilot what an advance cast he is approaching on an ILS localizer beam. As a result, he can make a direct "climb" on the beam, instead of the usual need for "biscuiting." By making possible more positive, quicker ILS approaches with considerably less maneuvering, the MIN-5711 promotes flight safety and helps reduce pilot fatigue.

For full details and specifications about this

new Bendix navigation instrument, write Bendix Radio, Aviation Electronic Products, Baltimore 4, Maryland, or 305-524-02.

Bendix Radio Division • Bendix Aviation Corporation • Indianapolis, Indiana
 Mail Order Sales • 10200 Maypole Blvd., North Hollywood, California
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Bechtel Boston Business + Bechtel Services Corporation + Bellanca, Inc.
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Bechtel International Sales: 2000 N. Alameda St., Suite 100, P.O. Box 1748, New York, N.Y. 10019

AVIATION CALENDAR

Sept. 27-International Air Transport Association, 125th annual general meeting, Edinburgh, Scotland

Sept. 27-30-American Society for Engineering Education, Annual Meeting, 56th and Associates Exhibit Hotel Studio, Los Angeles, Calif.

Sept. 27-31-Eleventh Annual International Automobile Conference & Related symposium, Hotel Americana, 1000 Madison Avenue, Columbus, New York, N. Y.

Sept. 27-28-international Congress of Auto Mechanics, sponsored by the International Auto Federation, Rome, Italy

Sept. 28-18th Annual Meeting, 1974 International Motor Vehicle Safety Test, Taylor Motor Safety Conference sponsored by USAA Safety Flight Safety Research Station, Boston, Calif.

Sept. 24-26-International Space Rocket Seminar, Hotel Americana, Columbus, N. Y.

Sept. 24-27-1976 First Issue of *Hot Air*, Bethesda, Maryland, Change 22

Sept. 28-National Security Industrial Association, Widespread Action, New York, N. Y.

Sept. 29-30-International Conference on Management, sponsored by Michigan Association of Airport Managers, Novi, Michigan

Sept. 27-29—Southern California's Engineering Conference & Exhibit sponsored by Engineers and Architects Assn., San Diego Chapter, Balboa Park, San Diego, Calif.

What makes

a wind tunnel *commercially* successful?

peaks, with greater accuracy than ever before possible.

Computer-Controlled Systems encompass the full control loop ... from sensor to final control element. They are pro-

speed and performance guaranteed on the basis of unique structure of the control system and fast process in operation. Computer Control Systems are applicable in new technologies of fast approach.

Write or telephone for full information. Informative new Bulletin entitled, "Value Data...economically produced by the economic process control" will be sent to you on request.



For Test Facilities . . .	Typical CompuDyne Output Spans
Aircraft Engines & Components	Continuous Wind Tunnel
Aircraft Aerodynamics	Dynamic Structural Loading
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Vickers Servo Pump Systems

Provide rapid and accurate response to minute electrical or mechanical signals

The Vickers Servo-Pump Unit shown at left is a signal-controlled, variable stroke, positive displacement, variable reversible flow, oil hydraulic pump. In combination with a motor or linear hydraulic motor, it forms a signal-controlled hydraulic transmission for accurate control operation and high-speed servo systems.

The servo transmission may be controlled as a power amplifier when viewed from the electrical signal input, of about five watts to the mechanical power output of several thousand watts. The basic units of transmission have been built having output capacities ranging from one to four hundred horsepower. The servo pump develops only that pressure required to move the load, which means reduced pressure over the greater part of the system life since peak loads occur only infrequently in the majority of systems. This greatly reduces power losses and associated heat rejection.

Any type of power system which can tolerate a signal capacity of about one watt can be used to drive the servo pump. The power source may be an air compressor, electric motor, gas turbine, hydraulic engine, etc. Sufficient constant speed is desirable.

Variable Power Volume Controlled by Signal

Heart of the servo pump unit is the Vickers Variable Stroke Hydraulic Pump. This is usually a one-cylinder pump housed in a pride-mounted valve. Varying the valve angle varies

stroke stroke, hence, output volume. This may be varied directly or after division of a load. A control signal actuated by a pilot valve varies the valve angle according to signal.

Low-Cost Power Requirement

Power for control purposes is supplied by a small motor or pump with a valve in it confined in the valve-motor assembly which is at a low power level (100 to 300 ml hydraulic system) separate from the power transmission hydraulic circuit although a part of the pump case. This valve-motor assembly controls valve position, direction and pressure in the power pump which can operate at pressures up to 3000 or 4000 psi. Pressure drop across pump is a constant factor, with an inherent linearity in control, the power transmission system. Total power output from the pump is determined by the volume of flow which the volume regulating system demands and by the actual resistance of the load. It is not dependent upon pressure drop methods of control.

In a control system employing this servo pump, the variations in gain resulting from load change are negligible compared to those which result from a similar circuit designed by a more enterprising designer directly to the power line.

Constant Displacement Hydraulic Motor

Flow and pressure generated in the hydraulic pump are exerted by taking

with an intermediate valve in the hydraulic system or linear actuator. The fixed stroke hydraulic motor provides torque directly proportional to pressure and speed directly proportional to flow rate.

High Power-to-Weight Ratio

The servo pump unit and its associated hydraulic motor are designed for high power-to-weight ratio, high torque-to-weight ratio, low inertia of rotating parts, and high resonant frequency.

Typical Features

High speed to weight ratio—1.5 lb. motor only
High torque to weight ratio—3.5 lb. torque
Low inertia of rotating parts—0.005 lb. sec.
High resonant frequency—10 Hz (motor system)

Other advantages are reliability and versatility of application. The smooth



several speed changes and ability to hold position against any variation in load are additional reasons why the unit is a desirable transmission which can solve many design problems.

Important among the applications of Vickers Servo Pump Unit is extremely fast and accurate positioning of aircraft landing gear. Another is the use of the exhaust nozzle for an aircraft. Here the servo pump is a characteristic of position as all other only sufficient power to meet the necessary demand minimizes the power loss and therefore the heat rejection. The greatly reduced average pressure level in this type of system protects the life and improves the reliability of all components.

For further information, ask for Bulletin 561-1 and 561-1B or get in touch with your nearest Vickers Aircraft Application Engineer. He can answer for an engineering team to consider your problem and propose an optimum solution.

VICKERS INCORPORATED

Hydraulic Components Division
Albion, New York 14411 and 15000 E. 100th Street
Reprinted 1962. © 1962 Vicks

Albion Application Engineers, 1400 Albion Street, Albion, New York 14411; 15000 E. 100th Street, Cleveland, Ohio 44118; 1000 E. 100th Street, Chicago, Illinois 60611; 1000 E. 100th Street, Los Angeles, California 90021; 1000 E. 100th Street, San Francisco, California 94131.

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Explainer and Releaser: 1962
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World's largest Aluminum Forging gives Navy's SeaMaster a lighter, stronger backbone

The Navy's new Martin SeaMaster is a multi-jet seaplane with performance comparable to land-based aircraft. Much of its high performance results from exceptional light weight.

One way the Navy saved weight was through the use of bigger forgings, such as the 5,800-pound giant, that form the backbone of wings and fuselage. Not only did this huge forging save the extra weight of smaller assemblies, it also made possible big savings in assembly time and machining cost.

It took months to construct the dies in Alcoa's shop, for these were the largest closed forging dies ever made. Each finished part weighs more than 40 tons. It also took one of the world's two biggest forging presses, the 80,000-ton giant recently added to Alcoa's Cleveland facilities.

The forging itself was squeezed from a 4,200-pound billet of X7039 alloy developed by Alcoa[®] for higher strength, better ductility and superior heat-treatability in heavy sections.

While production of this large forging was a manufacturing milestone, it also emphasizes the point that Alcoa has the facilities and technical knowledge required for solving any problem involving aluminum for aircraft. To learn more about these facilities and the tremendous depth of Alcoa's experience, write Alumitec Company of America, 1800-J Alcoa Building, Pittsburgh 13, Pa.

ALUMITEC PARTS ALUMINUM WITH ALCOA ALUMINUM FASTENERS



Your Guide to the Best
in Aluminum Value

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OF AMERICA

This enormous aluminum forging weighs 3,800 pounds.
It is 13 feet long, 2 feet wide and 1 foot thick.



SIMPLIFIED DIAGRAM illustrates a servo system using negative feedback. Vickers Servo Pump Unit and Constant Displacement Hydraulic Motor. This system accepts variable input, either electrical or mechanical, depending on type of system. Input pressure will affect output pressure from pump. This will affect output pressure to the load as required. For added stability and stability, a coarse loop providing output proportional to rate of flow may be added. This may either be built into the pump or the form of a controller, "hollow valve," which results in a control loop. If this is not done, the servo pump unit may be a variable displacement pump to do a coarse loop to fine ratio ratio to the amplifier. The controller output may be either a function of the position or velocity of the load.

WARREN WIRE TAKES OVER AS HIGH TEMPERATURE SPECIALIST



Only Warren Wire can provide a complete

From entire standard, stamped, or color-coded Cable Systems



CABLES

MIL-W-7139-A

WW400 — for Identification by Tagging
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Be Sure — Be Safe with MIL-W-6960 and in addition, **Sure Tapes** — **Sure Weight** — **Sure Heavy** with **MIL-W-500**. The world's most rugged, heat-resistant and vibration resistant cables of all types. The flat plated, copper braid of each is protected by superinsulated Teflon-braided glass and glass braid. With **MIL-W-500**, you save time, weight and money. **Tagging** or "tagging out" is no longer necessary! Color coding, through 10 solid colors and an unlimited number of color combinations, permits instant circuit identification anywhere it is used — or if you prefer to code with stamped marking equipment, there is **White**, **WW540**, **WW400**, colored "tapes" (tapes), the standard tag identification. Send for samples and Specification Chart "WW100".

through and including wiring for SOLENOIDS, SYNCHROS,



HOOK UP AND LEAD WIRE

MIL-W-16878-A

Type E and EE

WARENEER Teflon-wrapped
GLASTRE Teflon-wrapped; glass braided

A complete assortment of strengths, dimensions, colors and color combinations — to fit every need. All three types possess superior dielectric, insulative and resistance to water absorption; are unaffected by fungus. Where flexibility is required, these wires perform perfectly. Type E and EE wires have 600 and 1000 volt ratings respectively. Send for samples and Specification Chart "WW101".

In all electrical wiring and cables for aircraft, missiles and rockets we've beat the Devil at his own game

WIND . . . HOOK UP . . . INSULATE! From the smallest component to the entire connecting system — all can be integrated in one complete Class H system — to withstand heat up to and far beyond +400°F ambient. What's more, all these Warren Wire products are impervious to fuels, chemicals and solvents; have superior abrasion and cut-through resistance; and withstand cold to below -25°F.

Class H Wire and Insulation System...



MOTORS, ALTIMETERS, GENERATORS, AMPLIFIERS, SWITCHES

and every other electrical component!

MAGNET WIRE

MIL-W-19583

SELCONE or **TEFLON-COATED**

— any gauge can be wound on own diameter

Specify these wires for any chassis part where magnet wires must be degraded for an long, reliable service. They are processed and fabricated to withstand heavy manufacturing and operational stresses — even in the smallest diameters, are negligible adhesion and flexibility; abrasion and corrosion resistance; unique reliability and ultimate performance. They are wound on their own diameter, down to and beyond -400°F ambient. They have low dielectric constant and are nonflammable. Available in sizes 30 through 50 AWG. Send for samples and Specification Chart "WW102".

MATERIAL FOR CLASS H INSULATION

TEFLON-COATED-GLASS:

Fabrics Tapes Torts
Cordages Sewing Threads

All these "Polyte" Teflon-coated Class H insulations are dimensionally stable under pressure as well as heat. All possess superior mechanical and dielectric strength . . . have extremely low water absorption . . . are nontracking. They resist all acids, alkalis and solvents. These materials are available in all standard thicknesses and sizes. Send for samples and Specification Chart "TGG".

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**Contributing
precision-made
cockpit enclosures to
America's air arm**



Write for new *Kawneer Aircraft Products*
booklet for complete description of facilities.



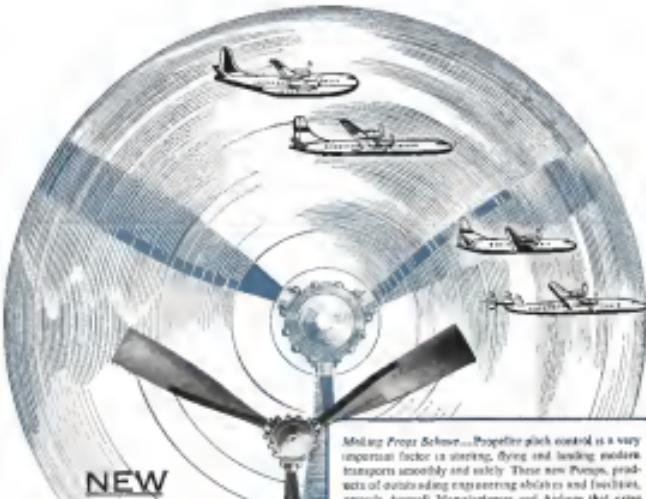
The Cessna T-37 will help to train tomorrow's jet pilots faster and at less cost. An enlarged cockpit enclosure made by Kawneer gives the instructor and trainee improved visibility. With our knowledge of acrylics and specialized facilities in our new, modern plant we are prepared to take the complete responsibility for your cockpit enclosure program. Our forming, cutting, edging, optical testing and gluing to metal facilities are available to produce any part of your cockpit enclosure—from the sashiles only to the complete assembly—write, wire or phone.

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and GREAT
Prop Feathering
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brochure containing
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Making Propeller... Propeller pitch control is a very important factor in starting, flying and landing modern transports smoothly and safely. These new pumps, products of outstanding engineering abilities and facilities, provide Aeroflot, Miniatraffic and Airlines that prove efficiency in Propeller performance.

*Propeller design and performance characteristics:
HIGH CAPACITY... LOW AMPERE... EFFICIENT
OUTPUT AT HIGH LEVEL AND ALTITUDE OPERATION...
EFFICIENT BLOW OFF VALVE CHARACTERISTICS... EFFI-
CIENT BLOW AND BLOW SHUT-OFF VALVE CHARACTERISTICS... COMPLIANCE WITH TURBINE CYCLE AND
ENDURANCE REQUIREMENTS... BLOW OR EXCEED ALL
APPLICABLE AIRCRAFT SPECIFICATIONS.*

*Making Propeller
Propeller Quality costs no more... Specify ADEL.*

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PRECISION PRODUCTS
A DIVISION OF GENERAL SIGNAL CORPORATION

BURBANK, CALIFORNIA • HUNTINGTON, WEST VIRGINIA

ADEL design and manufacture aircraft accessories in the following major categories:





750-TON CLEARING PRESS—
PART OF
**ROHR'S
MULTI-MILLION
DOLLAR
TOOL KIT**

This mighty press is one of the largest of its kind in the world. With its precise fingers it is particularly adept to the delicate function of forming compound-concave sheet sections for aircraft airfoils of many kinds.

Today, with this and hundreds of other heavy manufacturing machines, Rohr produces over 36,000 different parts for aircraft of all types. This is, of course, in addition to Rohr's being recognized as the world's largest producer of ready-to-install power packages for airplanes.

For design and engineering know-how, the full production facilities look no place to build more into the aircraft parts you need.

In addition to the featured C-128 aircraft shown here, Rohr builds plastic packages for many other leading commercial and military planes which have made Rohr famous as the

**WORLD'S LARGEST PRODUCER
OF READY-TO-INSTALL
POWER-PACKS FOR AIRPLANES**



ROHR
AIRCRAFT CORPORATION

PLANTS IN CHULA VISTA AND RIVERSIDE, CALIFORNIA; MUSCOW, GEORGIA—SOON TO BE IN AUBURN, WASHINGTON

**Whittaker has valves in production
for your missile system**



In addition to our valves for aircraft, Whittaker is now producing a wide variety of valves for missile systems.

The following list shows some of the units now in production. The wide diversity of this inventory Whittaker's extensive experience in the strict operational tolerances which characterize missile equipment—results in exceptional reliability and performance. Although the units listed below are for specific installations, they can be easily adapted for use with different pressures and flow rates.

We invite you to review this list. To obtain detailed information regarding any of these units simply fill out and return the coupon at the bottom of this page.

Whittaker's experience can be of immeasurable help in the solution of your missile design problems.

ITEM	SIZE	TYPE	DESCRIPTION
1	1/4" NPT	1/4"	Ball valves
2	1/4" NPT	1/4"	Ball valve
3	1/2" NPT	1/2"	Ball valve
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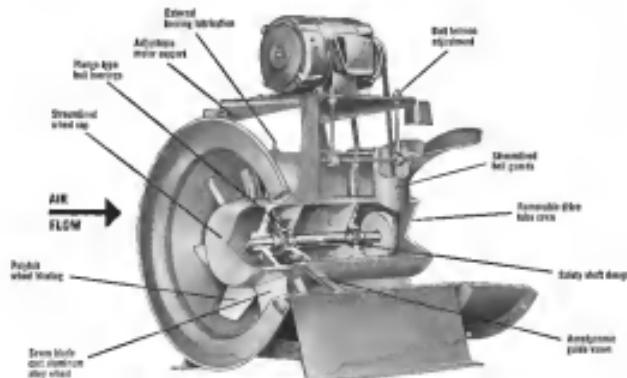
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Improved Westinghouse Axial Flow Fans for Industrial air, fume, vapor handling jobs!



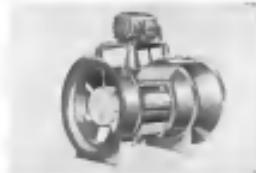
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With volumes from 1,700 to 100,000 CPM—static pressures up to 154—14 cases, Vaneless or Tube Axial, direct-connected or V-belt driven, with wheel diameters from 15" to 72".

- **Space Saving** . . . compact Axial Flow design permits installation directly into duct work.
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Spacely Inlet Vaneless Fan specially designed to provide easy access required for quick inspection.

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RYAN BUILDS BETTER



RYAN TO BUILD DC-8 JET PACKS AND PYLONS

Jet Packs. Ryan has been selected by the Douglas Aircraft Company to manufacture complete jet power packs and pylons for the new DC-8 commercial aircraft. Substantial orders for these 250 mph jetliners have been placed by 11 major airlines.

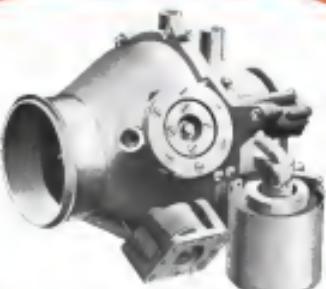
Structural Experience. The Douglas order, initially \$20 million, is the result of Ryan's outstanding record of performance in the design and production of jet engine components, afterburners, rocket motors, ramjets and exhaust equipment for turbo-compound and piston engines.

Engineering. Ryan is devoting a substantial amount of effort to working with Douglas personnel in the engineering of the DC-8 jet packs and the supporting pylons. Ryan has extensive experience in the integration of power plants and airframe structures.

Established, Equipped. A pioneer in aeronautics, Ryan understands the industry's requirements and fulfills them as only an aircraft company can. Ryan has the personnel and facilities to perform a complete job of engineering, production and evaluation of specialized structures such as jet packs and pylons.

With a background of 22 years of experience in aviation, Ryan excels in designing and producing high quality aircraft, power plants and structures, built at low cost, delivered on time.

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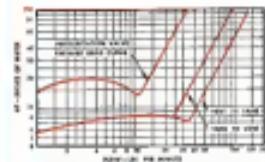
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As part of an air pressure fuel transfer system, this SCHULZ designed valve will prevent venting of vapor outside of fuel tank until tank internal pressure exceeds 5 psig; permit air to enter the tank when pressure drops below atmospheric with the vent valve submerged in fuel; a float operated valve prevents the valve from venting outside the tank until the tank pressure exceeds 8 psig; maintains tank pressure of 8 psig by controlling the flow of pressurized air entering into the fuel tank when air or fuel is venting outside the tank. Temperature range from -65°F to 290°F.

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International Mail Rate Problem

(Sir William Hulbert has called the attention of the 13th Annual General Meeting of the International Air Transport Association to a grave matter that will face these airlines the next 12 months when the Universal Postal Union will hold its congress at Ottawa to consider setting international air mail payments to airlines that carry airmail and mail. This is a matter on which Sir William has been eloquent in the past and his words express the problem well.)

"Government delegates go to these congresses as plenipotentiaries, with power to sign a Postal Convention which thereby becomes a binding agreement between governments. These government delegates are postal officials and are therefore, in effect, the sons of the air mail service. This is a very strange situation. The sons of the service run the sons by senior ballot without the transporter having any say in the matter at all. And you can't talk to a Postal Conference ten minutes without being told in tones of awe that 'congress is supreme'."

"There is only one thing for you to do. That is to see that the top officials of your governments—the prime minister or, in certain cases, the minister of finance fully appreciate the situation, so that they can instruct the post office people, if they will, to vote in the right sense when they get to the congress. This is something which each of you must do to enable us to accomplish our objective of not losing any revenue in performing this service for the public. If each of you says to him self, 'I find it a little difficult to speak to my government and I shall sit on the corner sitting on my right and the corner sitting on my left', then you may as well sacrifice yourselves to a loss of many millions of dollars."

"Remember, we are not asking for an increase in rates. We are only asking that the present rates, already

marked down some years ago at the Brussels Congress, should not be further reduced. Most airlines have a thin profit margin or none. If air mail rates are to be cut still further, we shall be in a bad way."

"Such an act would only mean that many of the major airlines would expect rebidding by their governments, and that money would have to come out of the pockets of the taxpayers. And remember to tell your minister that it would be out of the pockets of the taxpayer of those countries which provide international air transport and would go largely into the coffers of the post offices of the countries which do not have major air networks. I hope some of the larger governments will make it clear that if there is no attempt at Ottawa further to cut the rates, there will be no signed Postal Convention."

"Remember that, since Brussels when the rates were pulled down without consultation, the airlines have all lately decided to invest millions of dollars for the purchase of jets. This will increase the value of the mail commodity we sell, namely speed, by 40%. That increase of value benefits the postal administrators substantially by increasing their efficiency in the eyes of the public."

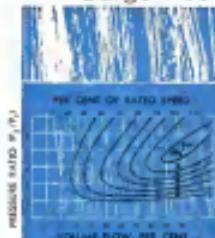
"Let me get there that such quid pro quo, business, dry docks, private relationships, contact with fellow men are all intensified and speeded up. It's a funny comment to choose for trying to cut our small postal revenues per airmail."

"We hope the international airmail head Sir William is coming and face the congress at Ottawa with the solid backing of their governments to resist any further attempts to slash international airmail and airlines for carrying foreign mail."

—Robert Haga

The Heli-Rotor Compressor

Surge-free • Efficient • No Containment Problems



Now available for aircraft applications is a new type of rotary-positive displacement compressor offering these advantages:

- High specific delivery at high speed—up to 40,000 rpm. Capacity 25 scfm at 32,000 rpm.
- High pressure ratios at single stage (up to 10:1) from small compact units.
- Surge-free operation with compression ratios independent of speed.
- High efficiencies reaching 90% built in pressure ratios.
- Suitable for high temperature operation—suitable for air, helium and other gases.
- Simple construction—single control system.

Heli-Rotor compressors are adaptable to a variety of drives: hydraulically sealed electric, turbines, hydraulic or direct from an engine. The design of the Heli-Rotor compressor assures unusually long and trouble-free service life. Industrial compressors have operated without stopping for as long as 3 years.

In these units, two helical lobes rotate past the entering gas, compress it and deliver it in an air particulate pressure. Two-stage machines with a 2:1 to 1 compression ratio have been designed. The patented design of the rotors is already proved in a variety of aircraft installations.

For more details on these efficient compressors write to:

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Washington Roundup

AEC and Nuclear Rockets

Aeronautical Engineering's brief engagement that its Los Alamos laboratory is "concerned with research and development of nuclear rocket propulsion" has been followed by much speculation, little fact. Disclosure that the laboratory's 3-D Division, headed by Dr. Rolfson Schenck, has been working on the problem for the last year, brought out additional information that the Lawrence Laboratory also is concerned with nuclear powered rockets. Both are operated by the University of California on contract to AEC. The AEC spokesman said the project still is in the feasibility study stage. There were indications, however, that work may have progressed far in the development stage. Although no one would say so officially, the AEC has three units with AEC and Los Alamos under contract.

The development was apparently a government effort. The AEC said its purpose was to let scientists and engineers know such work existed. The press office itself was based upon the employment of no engineers, Wilfred F. Carlson, of Basalt, Colo.

AEC Chairman Lewis E. Bransford recently announced establishment of the new program to assist colleges and universities in training nuclear engineers, scientists and technicians. One provides for grants of up to \$10,000 to any one institution for acquisition of equipment, the other for loans of certain nuclear materials and instruments, some of it free and some at 20% of list price.

More Authority for CAA?

The Civil Aeronautics Board and Civil Aviation Administration are launching a joint study of authority of an agency to find out whether some of CAA's rule-making authority should be shifted to the CAA. CAA felt that in some regulated fields, it would be a more effective rule maker because of its more intimate contact with the problems involved.

The CAA held discussions early this month with representatives of the airlines, the railroads, ports, air traffic and the CAA to study air traffic regulation. Further discussions will be held in an effort to find solutions for air traffic problems.

'Reasonable Probability'

Comment of Dr. Clifford C. Ferris, Assistant Secretary of Defense for Research and Development, on the artificial satellite during a talk before the American Institute of Chemical Engineers:

"The well publicized scientific article, which has a reasonable probability (though not necessarily a certainty) of success is the most important aspect of the program of the International Geophysical Year."

Soviet Talent Production

Add statistics on Soviet training of technical specialists including scientific engineers, agrochemists and for 1961. "The best available indicates that the Soviets are graduating these specialists at a rate only one quarter that of all NATO countries combined. For example, during the next five years we estimate that Soviet engineering higher educational establishments will graduate about 150,000

people-about triple our rate." An Air Force Chief of Staff, Gen. Nathan F. Twining, Gen. Twining illustrated the problem with the example: "This past International Balloon Matches estimates that 7,500 mathematicians will be needed to man computers as ofer, of which about 1,800 should be Ph.D.'s. Here is our support. About 210 Ph.D.'s in math will graduate this year."

Tighter Airways Control?

Aeronautics Subcommittee on Aviation, headed by Rep. Gene Hamm (D-Atk.), is pushing for tighter control of scheduled airline traffic. "We are going to have more aircraft—over 100 of the airlines don't want it. Hamm said last week during the second subcommittee hearing. "We are going to have more aircraft and require the airlines to fit in the airports."

James P. Lohr, acting Civil Aeronautics Administrator, and Oscar Babbitt, deputy director of the Civil Aeronautics Board's Bureau of Safety Regulation, agreed in favor of the present CAA and CAA policy of free and equal flight at air-density zones against the old opposition of the air commissioners, who wanted "See and be seen" in still the program of the day, Babbitt testified. He repeated that there is only a very, very small percentage of aircraft under positive control at present. "In line with its program for positive control of fast and high flying jets, CAA pointed out that the CAA will have control over traffic above 26,000 ft. by April 1962, and traffic above 33,000 ft. by Feb. 1, 1963. Separate measures, however, were not disclosed.

Hamm observed that there has been no hearing on flight rules and regulations for 15 years, and that the only substantial change came as a result of the conference over instrument landing system (ILS) versus ground control approach (GCA) in 1947. He added: "We must wake up to the fact that you can't drive a Cadillac under the same rules that apply to a horse and buggy. There can't be evolution of the air when there are going to be jets flying through it."

Subcommittee members maintained that there is a possibility that the Great Canyon collision between TWA and United Air Lines planes on June 30 might not have occurred if the United plane had been passed by CAA ground control in the location of the TWA aircraft. The TWA aircraft was in the location of the United plane when the TWA officer when it reported a change in flight course.

The CAA and CAA also were criticized by commissioners for failing to take action banning the practice of unlicensed drivers of flying low over the Coast Guard area for sightseeing purposes. Babbitt commented that that practice is one of the possibilities that might have figured in the Coast Guard crash.

ALPA vs. USAF

Air Force Secretary Donald Quarles has agreed to review the pay and costs of a group of USAF directors, calling for removal of key airmen promoted from the Air Force and Air National Guard ranks since (AWF) Sept. 3, p. 34. Most aviation officials, however, held little hope that a solution appears in the Air Force Pilots Association, which is fighting the direction, while it searched. A conference held at Washington last week brought the issue as close to a stalemate as ever.

—Washington Staff

Freer Rein for Industry Recommended

Defense Department study calls for better utilization of management skills in weapons development.

By Claude White

Washington—Full utilization of the aircraft industry's management skills will be essential in order to speed the development and production of new weapons systems, the Defense Department has recommended.

The major conclusion of the extensive study of the aircraft industry's management skills is that more time should be given to industry. The report, drawn up by a group headed by Donald S. Roberts, Defense Studies Researcher, Defense Research Studies Group, emphasizes that the armed forces are failing to get full benefit from the aircraft industry's talents at least.

"We feel," a Defense spokesman told *AVIATION WEEK*, "that aircraft procurement officers need a better knowledge of what the industry can do. Thus the industry should be given a contract and, along with it, the widest possible freedom to fill the contract."

In this connection, it was indicated that the study group has been unable to recommend to DOD's senior selection officers, although it does not specifically endorse the program.

Lessons Learned, More Power

Second most important recommendation is that lower echelons of military procurement personnel be strengthened, their power being enhanced. This could apply to USAF's Weapon Systems Project Office (WSPD) and the Navy's close desks.

The study blames much of the delay in aircraft development on the fact that decisions are held by whole groups of people as they are centralized to a high level in the senior echelons.

Also, the study found the lack of sufficient personnel at USAF for example cost funds that it does not have. The management talent to guide all senior echelons cannot along the path from concept to delivery. This is a lot of hours aircraft companies have to do the job. In exceptional cases, it has even lasted special management consultants, such as Flusso Worldwide Corp., which is responsible for various engineering and technical direction of the interconnection of ballistic missile.

The study group feels that, within the services, top authority over a weapons system project should be vested in a single office. This office, WSPD in Navy close desk, must have a staff composed of men and women to do the job and make its own decisions.

ments and Systems Requirements (AW Aug. 6, p. 56) to a selected list of potential contractors is considered a substantial advance toward proper dissemination of technical information. But the study group notes that industry should have more responsibilities still, such as data and codes and present efforts underway.

In this connection, staff members feel this is a vital need for more background information on the state of the art.

Finally essential is communication to get the data to the place where it will do some good. Requirements and technical account documents are often not in the situation. Therefore, it is believed that, in the long steps of the state of the art can be missed entirely, until developed or finalized and an adequate management procedure, or abandoned because a lot can still not know a few facts.

Lack of new ideas results the problem in that no one can find a way to be the better. Commission, when it is used, has the added form of conservatism in seeking new approaches. Possibly this is true outside the field of weapons, but these are problems in the budget, manning, and procurement fields that lead to stabilize the military when it is based on new technological facts.

Time in Processing

On procurement financial freedom, the study group feels too much time is spent processing requests. Here again is the slowdown procedure of reading a page of paper from desk to desk, having key people to make their decisions one after the other. Contractual review with manufacturers when it is used to delay decisions.

With capture on many fronts and better procurement policy decisions, the study group sees a need for "more concentrated attention on the development of supervisory responsibilities, more complete facts to justify a new requirement, more adequate pallet sizes of new weapons requirements, and more effective policy attention to long leadtime technical problems."

There is a strong feeling that the armed services do not get the most out of their best technical information which comes from such places as industry to industry or the National Advisory Committee for Aeronautics. Also, the Defense Department of Technology and other laboratories, the laboratories of the various universities, the various aircraft companies, and the aircraft manufacturers.

The F-107, originally designated the F-108, is a full-scale, with a lot of work and analysis on top of and behind the cockpit. Speed is comparable to that of the Republic F-105. Propulsion is a Pratt & Whitney J75 with afterburner.

"The job of getting information around to the right people at the right time is not a simple thing," one group consultant said. "An important function of ours is to keep the development of requirements from interfering with the speed with which new weapons are produced."

It was pointed out that time is consumed in the development of new aircraft when there is no concentrated study of their application. A breakthrough in the state of the art in a single area can easily change the entire concept of how aircraft design will be made. Usually basic breakthroughs are in the field of propulsion or a sensor and, as a result, for example, in the switch of a fighter into a light bomber.

Single Recommendation

The study group makes a single recommendation regarding the existing Armed Services Procurement Regulation (ASPR). It favors attention to ASPR limitations on the amount of profit that can be allowed for cost analysis, research, and development, plus participation by industry.

The study advised that more authority and less the advancing price to big prime contractors in whom the profit forfeiture clauses are of little import, since these also are making more substantial amounts on production runs. Each "Man at the small compass" can make worthwhile contributions to the research-and-development effort but are discouraged in the use on its center.

It must be stressed that the study group does not consider a Defense Department procurement center the result of a lot of "Mega Action Committees," and the board feels no change with drafting proposed implement plan, which should be ready early next year.

The work is a joint effort of USAF, Navy, and Air Force, who agreed to making this recommendation. Next year is expected to find these men best way of carrying this out.

In the course of its study, the staff studied every major manufacturer of weapons, including aerospace, and various aircraft manufacturers. Data was collected from over 600 representatives of the Defense Department and 30 aircraft manufacturers and research organizations.

The complete report of the study group is available (AW Sept. 10, p. 25). The Defense Department will also have a 17-page report on the subject, which contained a negligible amount of positive information.

Members of the study group, in addition to Defense Secretary Robert, are: W. J. McNeil, Assistant Secretary of Defense for Personnel; and Frank D. Newbury, Assistant Secre-



Lacrosse Missile

Lacrosse missile, shown in this *AVIATION WEEK* artist's conception, is a tactical weapon developed for close support. Complete system design and development responsibilities were given by Army Ordnance to Cornell Aeronautical Laboratory. Subcontractor work was by the laboratory on ground equipment. Production of the missile is under contract at Glenn L. Martin Co. Martin Corp., one percent of the system, has begun testing planned to Robert Bosch, Inc. and Martin for preliminary saturation in the use of the weapon. Lacrosse is underpowered by its booster guidance system, not impacting closure rate of the missile during flight. Range is approximately 15 mi.

try of Defense (Applications engineer).

• G. C. Farris, Assistant Secretary of Defense (Research and development);

• Robert C. Langley, Jr., Deputy Assistant Secretary of Defense (Supply and Logistics);

• Charles G. Fausse, Under Secretary of the Navy;

• James H. Douglas, Jr., Under Secretary of the Air Force;

• David L. Channing, staff director;

• Thomas D. Mann, who conducted

of Michigan; Willow Run Laboratories, Blairstown Engineering Co., Army's Defense Research and Development Corp.;

• Robert C. Langley, Jr., Deputy Assistant Secretary of Defense (Supply and Logistics);

• Charles G. Fausse, Under Secretary of the Navy;

• James H. Douglas, Jr., Under Secretary of the Air Force;

• David L. Channing, staff director;

• Thomas D. Mann, who conducted

Navy Seeks Turboprop Observation Design

Washington—Navy has given an indefinite specification with QDR for a proposed design for a 100-kilometer range observation plane to be used in the Army and Marine Corps (AW Sept. 14, p. 31), using either the Sun Laminar T-33 or General Electric T-34 turboprop engine.

The Army has favored heavier testing and the Marines have favored side loading (AW Sept. 4, p. 34). But open bayons are more likely the arrangement, leaving wing loading arrangement optional.

Both the Army and the Marines have been studying use of aircraft on Platz 3000, with a weight limit of 10,000 lb. The weight will be measured, both from the ground and from various altitudes at the site in the Pike Park area of Colorado.

The remaining stations have been established and of these on Platz 3000, eight will be weight limit aircraft will be measured, both from the ground and from various altitudes at the site in the Pike Park area of Colorado.

Orbital testing part is George McNeil, Laboratory Engineers Research and Development Laboratories, Naval Ordnance Test Systems, Naval Air Warfare Test Center, Rensselaer Polytechnic Inst., Ohio State University Branch, Los Alamos, Scripps Institution of Oceanography, Seneca Corp. of America, Southern Research Institute, University

of Michigan, Willow Run Laboratories, Blairstown Engineering Co., Army's Defense Research and Development Corp.;

• Robert C. Langley, Jr., Deputy Assistant Secretary of Defense (Supply and Logistics);

• Charles G. Fausse, Under Secretary of the Navy;

• James H. Douglas, Jr., Under Secretary of the Air Force;

• David L. Channing, staff director;

• Thomas D. Mann, who conducted

First Flight of F-107

Los Angeles—North American Avia-

tion's F-107, an advanced version of

the F-106 series, made its first flight last week from Edwards AFB. Pilot for the

flight was Robert Stultz, North Ameri-

cans' chief test pilot.

At the end of the 15-minute flight

which took nearly "over 10 minutes,"

the aircraft's dog deck folded on landing,

and the F-107 rolled into Edwards

15,000-ft runway into Region 1. The plane had been the nose gear collapsed when it struck a rock. Damage to the aircraft was minor.

The F-107, originally designated the

F-108, is a full-scale, with a lot

of work and analysis on top of and behind

the cockpit. Speed is comparable to that

of the Republic F-105. Propulsion is a

Pratt & Whitney J75 with afterburner.



French Air Force Sikorsky S-58 helicopters land between two others at Air Force base at Boudjellal.

Special Report from Algeria, Part I:

French Meet Guerrillas With Helicopters

By Robert Farrell

Algeria-Two cutting helicopters—Sikorsky S-58s and S-58s, Vertol H-21s and Bell H-13s—have flown more than a third of the 700 mission French air forces average weekly in the Algerian campaign.

Bell H-13s and Sikorsky S-58s are doing a big job for the French, but recent additional orders for 40 Vertol H-21s and 110 Sikorsky S-58s under stress the extent of the French in these large types. French Delmas Min and Gouraud, chief of staff of the French forces that it was asked to take the under dog, and difficult in finding the routes and disengagement of the French Air Force and train over which traps, is best suited to the campaign.

French Planes

During with the rebels for brought little said for jet equipment which in no earth to me against an enemy which really appears in numbers. Besides, many bases in Algeria have not been modified to handle jet fighters.

Mental jet fighters are in operation

but of the 200 light fighters the French expect to have in operation by year end, a notable proportion will be North American F-104 trainers, ground-attack fighter jets, and surface-to-air missiles and surface-to-surface missiles. French and the T-33 is much used for their operational needs.

Less than 10% of aerial attacks have been direct striking and bombing attacks against the rebels. However, the French Air Force will continue the jet fighter which is most effective short against ground. Most of the French Air Force has been busy cutting roads, launching the guerrilla supply, attacking the rebels, observations, and evacuation of wounded.

French Air Force has shifted itself completely to ground force requirements, and air support at Algeria coordinates has not been remote from. General force have their divisional headquarters. One, Algiers, and Constantine. The other division is attached.

U. S. Designated

Helicopters previously being used in Algeria are U.S.-designed, though all

the Bell H-21s and some S-58s are foreign-built. Actually, airways transports carrying supplies to heliports originally remain being sprung. The H-21s and S-58s put high operating standards.

French Air Force and Army ground troops are operating in Algeria a fleet of only 90 helicopters, including 11 H-21s and nine S-58s. In addition, the French Navy, working with the Army, is running two H-21s.

The overall figure reflects losses due to accidents which apparently involve a dozen ships, including two H-21s and one S-58. In one case the ship was sunk.

The main centers at the moment centers on the H-21 and the S-58, and these are continuously assault operations during much of July and through out August.

The command-and-control operation shows, the first time such a mission has ever been, and generally, are carried out after a repeat order from a ground force commander for and in clearing out an area where a rebel base has been spotted. Ships are assigned to the mission, and the number of planes is set, about 90 to 150 in to the pickup point. The planes, whenever possible, is located near a fuel dump or where there are roads suitable along the mountains—in that

the heliports will have full time for the mission.

Troop loading takes place quickly, the men are strapped, strapped, strapped to the floor, via often, loads more on the temperature and altitude than on whether the ship is an H-21 or an S-58.

French troops are loaded the minimum under way. The helicopter generally has an average of 10 m/s only, but over exhausting territory that would take trips of dry in case of climb. When the drop zone is reached the heli eases either lands and lets off the troops at the same time while the commander may extract himself. In that case the helicopter goes up, until there are cases around. Have the space of 10 to ten ships is not unusual.

Once unloaded, the helicopter flies back to the pickup point and rotates again, keeping at 100 until all the troops have been placed in position.

Strong Resistance

As this operation the French have taken much of the sting out of the rebel forces, but they are still there. Now, shortly after a battle begins, the French rotate ships around the area to return to the mountain they can into writing, commandos, and fire.

Helicopters try to stay clear of the areas combat zone. This will always be, but in areas where men are packed with lots. Once a battle is over, the wounded are embarked and



ARMED VERTOL H-21 hover in Algerian mountains against heliport landing. Army and Air Power differ over merits of H-21, S-58.

'Les Peepers'

The French call them "Les Peepers" and they have proved impotent to all other light observers with updated to the Algeria campaign. These are the Piper Cub, operated to the surprise of the Air Force by the French Army, and being used to mounting weakness.

Pipers have done excellent "cover" duty. British hands had been mounted in numberless military operations, making many missions successful, but the French found that 4 they flew even an unarmored Piper Cub over the range the rebels stayed under cover.



NUBREXICO H-47 helicopter lands with reinforcements on plateau in central Algeria



NORTH AMERICAN H-47 in use in Algeria. Other combat missions are under way



REPUBLIC R-47, landing for resupply from central Algerian base, also transports rockets

base to base hospitals within an hour of being hit.

An objective arrived in the interventional question is to which helicopter the H-21 or the S-58 is better. The two companies' operations both had to come to it. For one thing, both the H-21 and the S-58 are used only by the French. More important, the two and rates of each such unit have clouded in a dispute between the French Air Force and Army, and make the differences between the U.S. units.

French Air Force has the S-58 in Algiers and claims it does a better job than the H-21. Conversely, the Army uses the H-21 and insists it is better all round than the S-58.

French Navy approach this both. It has ordered the S-58 since the H-21 is too big for the shallow harbors in French coastal areas. Yet the Navy is using the H-21 in Algiers and seems to prefer it. In order, actually, the Navy was the first military branch to interest itself in helicopters and seems to take an unusual interest in the Air Force. Army also uses helicopters, qualities. Navy pilot lost half as many hours on 19 H-21s as did the Army on 19 S-58s.

Under the present military setup in Algeria the Air Force and Army don't speak, thus hindering the two from the same. The country—which is as big as the U.S. east of the Mississippi—does not have a clear-cut line of command, and French helicopter requirements in western Algeria. Army for eastern Algeria. Both claim they have the most difficult terrain.

Test of Both

French have held a combined evaluation test on the two helicopters and it was in the test that the two units clashed. It is worth noting that the Army is committed to the H-21 and the Air Force to the S-58 even before the trials. The French, however, have been divided but settled their facts on the S-58.

The endurance test was carried out in two parts. The first took place over a 100-mile patrol route in July at Béjaïa in the rugged Atlas mountain region. The second was held later in the month near Algiers, at well over 100 miles. The H-21 was flown in French Army prints, the S-58 by French Air Force prints. Officially at the three services, the Defense Ministry and civilian, including representatives of Veolia, Sidiou and Cottrell-Wright, were present.

Agreement to conduct a resupply test was performed the 23rd through 25th on the 100-mile route to be a non-vehicle drop for ground force requirements. The Army officially advised the S-58 pilot on a better performance, but insists that the H-21

clearly demonstrated its adaptability in ground force tasks.

On a range test, with a payload of 1,200 lb., the H-21 reportedly performed with 202 nautical mi. The S-58 reportedly with 37% fuel used as though its total fuel capacity is 43 gal. less than the H-21.

Recently, however, the Army half-truths have said, a new 127-stage test has come out to the Army and the Army has not yet been informed about the official evaluation test. An H-21, piloted by Verluis' Wilson 15, Cottrell, flew 340 nautical mi., a decided improvement though still 35 minutes short of the S-58 mark.

Another test during the official evaluation involved a refueling contest. Reportedly each ship had to transport 130 tons of 100-kilowatt. The contest, incidentally, was held at sea level. The H-21 carried 120-tlb. passengers, for which it has four seats of seats. The S-58 had two seats. The H-21, after 100 miles, had 100 French official complained of "severe rain-hour endurance" within the ship, and from this the S-58 was permitted to take only 15 passengers, for which it has that number of seats.

Reported update of the contest was that the S-58 made each refueling in a time less than the H-21, but the Army named each trip trip.

This contrast of performance is remarkable when discussing the two ships with Air Force and Army effects. The Air Force has the best performance in terms of rate of climb, forward speed, etc., while the Army climbs on wheels.

Thus the Air Force gets the best rate of climb, the S-58, this should it could climb to 14,000 ft. in 11 min. and that it can 100-kt. free load and from 100-80 ft. under load. The Army, on the other hand, take more time the two from the H-21, climbing far more slowly and rate in fueling fuel consumption as fueling gaps gaps fuel gauge and telephone poles. Army

H-21 Maintenance Pact

Marine Corps Aircraft Corp. announced that a Rescor, Gomme, has will handle the maintenance, overhaul and repair of 425 helicopters located Europe.

The work will be carried out at the Luxembourg and Brussels plants of the company, Westinghouse France and Vossdrift-Großhöchst. The Rescor agreement also gives the firm an option to build H-21s for sale to Europe and Africa.

The Army claims that this isn't a problem for a second place.

A large proportion of the Air Force

aircraft are the H-21 cargo ship, its 12 lifts instead of the S-58 eight, the H-21's fine access between pilot and crew members inside the ship, placement of the fuel tank, well aft of pilot and engine, and finally, the H-21's preference for carrying alive cargo.

Surprisingly, however, these doesn't seem to be much difference between the two when operating at high altitude, which often is the case in Algeria. Both the H-21 and the S-58 have a range of 12 hours on combat missions, truly more than that.

Undoubtedly, the French would like to see some modifications made on both Army, for example, as putting in full seating gas tanks on the H-21. Many tank, on the S-58 already is self-sealing. Army is also interested in the idea of installing a turbine engine in the H-21, for the ship is designed to take whatever loads than its present powerplant is capable of lifting. This is not to much the case with the S-58.

The S-58 is powered by a Wright 1820-84 engine, the H-21 by a Wright 1820-103. The S-58 has a takeoff rating of 1,325 hp., at 100 hp. more than the H-21.

This extra power, according to observers on the scene, has occasionally enabled the S-58 to perform various operations—such as lowering under certain conditions in lifting straight up out of a confined area for some distance that probably would have caused the H-21, at least, to stall. The Army has claimed the H-21, at least, has a much better rate of climb, forward speed, etc., while the Army climbs on wheels.

Thus the Air Force gets the best rate of climb, the S-58, this should it could climb to 14,000 ft. in 11 min. and that it can 100-kt. free load and from 100-80 ft. under load. The Army, on the other hand, take more time the two from the H-21, climbing far more slowly and rate in fueling fuel consumption as fueling gaps gaps fuel gauge and telephone poles. Army

disinterested observers think the best answer is that the S-58 can get in and out of spots that the H-21 couldn't, and vice versa. With its two doors, for example, the H-21 has a clear advantage on slope landings under certain wind conditions. Yet the S-58 reportedly is easier to land than the H-21 due to its more power and the fact that its main gear is wider than the pilot. In rough areas H-21 pilot can't be sure just where the landing gear is setting.

The Army claims that this isn't a problem for a second place.

The Rescor order is for the 70118 with Pratt & Whitney T-57 engines, the aircraft of the Boeing 707 series. The turboprop transport will carry 70 to 120 passengers and a full payload of 34,800 lb. Cruising speed will be 550 mph., range 1,500 miles.

Proximity Device Orders

New anti-aircraft aircraft, including American, National and United, will order proximity weapons/electro-mechanical systems from Collins Radio Co., following an announcement, selection of Collins' technical proposal for an FM-CW system as the best of 10 submitted to competition. Unusual aircraft action in seeking equipment which has not yet been developed reflects industry's concern over the problem. Collins expects to flight test a prototype pair early spring, testing design phase I of a two-part program leading to collision avoidance in 12-18 months.

Chinese war helicopters in Algeria are also reported to fly relatively low, releasing weapons during stages of combat operation. This wouldn't be the case, since Air Force people believe, as a conventional war.

Majority of Army officials, however, believe that the helicopter lessons being learned in Algeria are very important for future war, particularly those who were troops must be moved about quickly. Army feels that future helicopters, capable of carrying 30-100 men at least, will have to have 10 or more seats. That's why, Army says, it is now building up experience on ships like the H-21, and the Army believes would solve some problem of ground movement and, with large rotor diameter, appropriate landing areas.

Now the PAF government feels about the S-58 versus the H-21 comparison is best kept by making its action after the evaluation test results were all in, April 10th.

(This is the first of three articles on phase one of helicopters in the war phase of the Algerian campaign.)

Qantas Buys Seven Boeing 707 Airliners

Qantas Airways Ltd. has ordered seven Boeing 707s from its own aircraft division. With the order the Australian carrier plans to be the first foreign airline to put American sub-supplier's on service.

Delivery of "Qantas" seven Boeing 707s is scheduled for the period between May and September 1959. This aircraft will be used to replace its present 707s which are 10 years old.

The Qantas order is for the 707-118 with Pratt & Whitney T-57 engines, the aircraft of the Boeing 707 series. The turboprop transport will carry 70 to 120 passengers and a full payload of 34,800 lb. Cruising speed will be 550 mph., range 1,500 miles.



ROLLAND GR.1, now powered by 4,000-lb. thrust Bristol Orpheus engine, goes striking demonstration at the SBAC show.

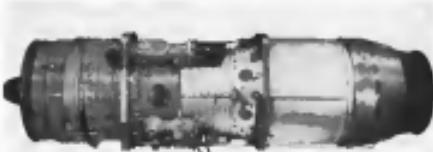


PROTOTYPE VICKERS VULTURE supersonic fighter No. 7 is shown fitted with two Pilmor P.1010 air-to-air missiles.



AVRO 698 engine thrust unit is to be fitted in the nacelle of a Hawker Siddeley F Mk. 6 fighter. Galleys are on each side of rear fuselage.

AVRO 698 is to be used for Rolls-Royce Tyne turboprop engine.



PIRELL 800 view of Bristol Orpheus 802.6 engine rated at 14,000 lb. thrust.



ROLLS-ROYCE Avon RA.29 engine is destined for Capita Avions Concorde 4A.

Enthusiasm at the 17th display of the Society of British Aircraft Constructors show at Farnborough was no sales effort, but technical achievement. (Aero Sept. 10, p. 260. Some details, like the Rolls-Royce Avon RA.29 engine, are shown both here.)

Specification of the Avon RA.29, which will power Capita Avions Concorde 4A, is as follows: 10,000 lb. static thrust; thrust specific fuel consumption at sea level takeoff at 7.75 lb/lb. hr.; net dry weight 3,341 lb.; length 124.6 in.; and diameter 42 in.

Rolls-Royce's Gnat is the highest rated British engine, officially 14,000 lb. thrust—but the de Havilland Gnat on display is rated at 19,000 lb. Another Rolls engine shown, the 1,000-hp Avon, next page is scheduled to power the Vickers Vanguard and is being tested for the Lockheed Electra. The corresponding engine is 6,770 shp.

Little can be said of the impressive fighter shown, but the Tolland Gnat, designed and built as a private venture, got on a high display. Flight trials of the second armed Gnat are expected to begin this fall.

Parry Turfash appeared on Swift soil on Friday, but is not in operational use on either Super Sprite radios, that have been developed by de Havilland as auxiliary powerplants for the Vickers Valiant bomber short field takeoff capabilities.



VICKERS VULTURE fighter takeoff run in test with the aid of two de Havilland Super Sprite rocket engines (Aero Aug. 23, p. 74).



PARTY of Soviet air officials, headed by the Minister of Aircraft Production, Peter Vaughan-Williams (center), walking back into the R.A.F. site at Farnborough. Coast pt transport plane is in background.

Britain Opens Curtain for Soviets

Farnborough, Hants, England—Russia's dirigible visiting Britain for the SIAC flying display in response for Royal Air Force and aircraft industry invited the Soviet Union to open its curtain to the Soviet Union's aircraft, and far more here than visitors (other wise shown at Farnborough) were shown at Farnborough.

The Russians at the Farnborough air show showed only quick glimpses of military aircraft in flight and ground preparation from viewing cars. At the SIAC show, Russian visitors were permitted close and leisurely inspections of British aircraft and transport aircraft on the ground in addition to the flight performances.

Commander of the Red Air Fleet flying boats, comraden, Lt. Gen. Alexei Belyaev, comraden was presented to by a Hawker Hunter low-speed trainer when he asked to do so. He was taken up by Hawker deputy chief test pilot William Berford for his flight. On the occasion the Russian general made a speech in due and a laudus.

The performance was particularly exciting to the British public who have been bidden from flying right in the Hunter plane for years, minus.

The two-seat Hunter has a less-powerful Rolls Royce Avon engine than the Mark 6 fighter now going to the Royal Air Force.

The Russian team another first

when they saw the Armstrong Siddeley piston engine for Supersonic fighter engines. This is a much heavier propulsive and engine than the Russian aircraft had at their disposal until recently during a plant tour in Moscow last summer. The Russians also visited the Sperry instrument plant and the National Physical Research Laboratory in addition to their Royal Air Force visitors.

and four R.R. (AWI Sept. 10, p. 13). The first stage is 5 ft. long. The booster is 9 in. in diameter, and the second stage is 8 in.

A 30-foot nose cone contains a ring wave trap recorder that charts rocket acceleration and nose cone temperature during pre-ignition.

Nose cone configuration, dimensions and properties may be changed, and the effects of the change studied in relation to hypersonic flight, going data on aerodynamic shapes, aerothermometric heating, rocket stability, and pressure distribution according to ARDC.

HTVs are fired from a 16-ft. portable launcher. All seven booster rockets are ignited simultaneously. Separation is after the four-second stage rockets. A special servovalve that is used to restrain the launcher when it is being lowered seconds after separation, then initiates a fast fire as boosters fall. The second stage has semi-charge within the rocket, and the nose cone is made to catch in a flat top at about 100 mph.

HTVs are expected to cost about \$5,000 each. Work on the \$1 million contract began in 1953. First flight was in November 1954.

By Robert H. Mills, chief of the fluid dynamics research branch of WADC's Aerodynamic Research Laboratory, a director the research. Com. with F. Sturtevant and Lt. John H. Liss, see WADC task research on the project [Feature of Aerodynamics hypersonic heat-vehicle appears on page 114].

Aerophysics Develops Hypersonic Rockets

Washington—Development of the first of a family of hypersonic research rockets was announced last week by the Air Force and the Air Research and Development Command.

Because of the hypersonic test vehicle (HTV), was reported by Air Force Weekly on April 23 (p. 31).

Twenty experimental models of the two-stage, solid propellant rocket have been fired at ARDC's Holloman Air Development Center. The HTV, now nearing standardization, was developed by Aerophysics Development Corp., a division of Curtis-Wright Corp., in conjunction with ARDC's Wright Air Development Center.

Booster stage of the HTV consists of seven solid with thrust limit. The second stage consists of four rocket

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LOS ANGELES

Crowds Drawn by Air Show Save Canadian Event From Extinction

By Alphonse W. Joseph

Toronto-U. S. Navy's Blue Angels flying Canadian F5F Cougars and a French test pilot in the Fouga Magister 170 light jet immerse the show at Canada's Third International Air Show.

Held in conjunction with the Canadian National Exhibition for the first time, the air show opened to much 10,000. Prior to the last two days, exhibition attendance was off 30,000. Length due to the air show, the last two days' crowds more than made up the difference and set a new record for the two week exhibition.

The record pullipper probably saved the Canadian International Air Show from extinction and raised the expectation at a permanent fixture at the exhibition. The previous year the show had been held in conjunction with the Toronto International Film Fair, a government project encumbered by the strictest of production budgets. In addition, the exhibition was in the nature of a loss.

United to Flying
Besides the exhibition had already leased all exhibit space before the exhibition there was no room for static exhibits. Thus the air show was limited to flying displays.

Plans are already being laid to alleviate some space as revenue fees for the exhibition at next year's exhibition are being worked out. Exhibit space will be available to foreign as well as Canadian exhibitors.

More ambitious plans have been made for a permanent aviation village. An air show officials hope the exhibition management will be able to complete it in time for the 1958 show. Besides this intent, both the Canadian aircraft industry and the military services are expected to increase their interest. The Aircraft Industry and Insurance Association, representing aircraft manufacturers and insurance companies, has made its move into the air show. Its officials now have around the air show offices that they are prepared to take a more active part.

The staff officers of the Royal Canadian Air Force socially are now prepared to put on a more dynamic display. They felt that the U. S. deserved the right to show. In particular, they were chagrined at having the U. S. Navy put on the obviously best spot on the schedule—the concluding act by the Blue Angels aerobatic team.

F106 from Chicago to Toronto in 39 min. Average speed 742 mph.
• Flight 106 on RCAF's CF-106 all metal fighter from Tofino, Newfoundland, to Vancouver in 1 hr. 5 min. The distance is 1,294 mi.

• Major showing of the Royal Canadian Navy's aircraft against McDonald Barbers' other fighter planes.

Other flights were made by RCAF's T-33s, 4-Ss, CT-110s, C-113s and Central Command P-11s; RCAF's Canadair CT-133s; USAF's F-86Ds, B-57s, KC-97 refueling a B-57, F-94Cs, and F-89Hs.

In a straight flight were several Canadian aircraft: Avro Canada's CF-100, de Havilland Hornet, Royal Canadian Air Force's CF-105 and CF-106.

News Digest

More than a third of Navy's Douglas A-4D Skyrays, grounded early this month because of a defective afterburner mounting flange, were flying again at the end of last week. All should be back in service by end of next week.

Mosine Sustainer M8 760 Pan prototype completed first part of test flight. Second prototype now in ground testing ground tests for the entire program.

Besides the Blue Angel aerobatic demonstration and the flying displays of the Fouga Magister, highlights of this year's Canadian International Air Show included:

• Demonstration of the de Havilland Beaver and Otter amphibious light transports. The 10,000th Beaver is now in the collection line and de Havilland's backlog is about 200. The 100th Otter has been built with at least another 100 more scheduled.

• Record flight of four U. S. Navy

Russians Absent

Russians did not appear at the Canadian International Air Show, despite the intent that they express in Edgar Albrecht, president of the Toronto Flying Club, of the Toronto 6th Air (AW) Job 2, p 20.

In fact there were a number from the Soviet Union about the Toronto show. The Russians are reported to have applied to Canadian Ministry of External Affairs for permission to be represented at a display to issue after Canadian air at October. No display is scheduled for the tour and plan remained. Without explanation, Canada turned down the request.

Area Viking bombers powered by four Bristol Gipsy six-cylinder piston engines flew 11,600 mi from Britain to Australia in 21 hr. 9 min. Flying time, averaging over 500 mph. Fuel stops were made Aden and Singapore. Shortly after Viking left Aden, its radio system failed, knocking out communications over Indian Ocean and Australia.

AIR TRANSPORT

Special IATA Meeting Report

Jet Orders Demand Airline Sales Push

Director General takes calm view of capacity implications but emphasizes breadth of increase.

By Robert Dorn

Edinburgh, Scotland—International air traffic must go all out for the main transportation market if there are to enter the coming 20 years successfully, Sir William Hilditch, director general, told the opening session of the biennial annual general meeting of the International Air Transport Assn. here.

He warned airlines that the fleet of jet aircraft which have already well exceed the present capacity of IATA members 2,700 planes, must make major jet sales soon to save costs, expansion, and rates to cope with the new era.

Sir William told IATA members that his forecast of future exports of major jets falls along the lines, because the prospects of disaster were felt that airlines have bought way beyond their needs, forcing traffic into the market which was not prepared for beyond the foreseeable traffic levels and the optimism they took. For a capacity shortage in 1968 and are warning that load factors will be marginally high in 1970.

"The industry has to begin now the hard work which will be necessary to make that forecast possible," he said.

"One very important aspect of this work will be to consider the fare structure necessary to fill the new aircraft and keep the older types of aircraft flying for as long as they are required. Airlines must find out how to get all out for the more initial and more normal to governments, and then pass down to the lowest level consistent with sound economic principles."

Other Major Requirements

Among other major requirements for the jet age along with proper fare structure, Sir William cited:

- Scheduling. Cost of air travel in the future will depend on large measure on efficient utilization of jet transport flights. This means airline travel must be made more round the clock, especially with night arrivals and departures accepted as normal practice and punctuality of 30 minutes accepted as normal, efficient, straightforward and healthy.

Services, transportation in and from terminals, availability of hotel facilities and instant and information services at any time of the night.

- Navigational facilities. Old concepts of air navigation, radio control and strength over natural air space must be revised to cope with jet traffic and traffic. Sir William warned that it will no longer be feasible to use geodetic boundary considerations for controlling high speed transports. He said the enough revised ICAO navigation plan for the Caribbean region was at a step in the right direction. The cost of radio navigation equipment must be reduced, high speed aircraft must be content to smaller control areas for handling short-haul traffic.

- "This is the type of border handling of the zones involved in going beyond natural boundaries and revised passage which will become essential in future planning of air traffic control systems in all other regions." Sir William said. "Aided to the maximum and continuous dispensation of airspace boundaries in the event more extensive practice which can only be termed a political expedient, whereby, control could be given to the maximum to the responsibility for controlling aircraft in the same space. The only political solution naturally is to establish a single center controlling the whole area and this must come from a realization that technical and operational considerations must take precedence over political practice."

- Ground handling. Something has been strong in the coordination between firms responsible for placing agent function and the airlines who were then negotiating in Sir William's line. This has created the ground handling chaos that exists today and adds unnecessary time to air travel. He warned that the vital simplification of ground handling procedures necessary for the jet age will come only from developing national buildings and maps that are as modern and efficient as the jet transports they will have to serve.

Utilization of the current types of jet engine transports after jet aircraft operational in large numbers is a serious technical and economic problem the industry will face. Sir William also cited two great unknown factors in making accurate appraisal of the consequences of the jet transport era:

AVIATION WEEK, September 10, 1968

• Existing restrictions of tourist travel from Europe to America. He warned that nations must be forced to make the transatlantic tourist trade a two-way street.

- Influence of fuel situations on traffic volumes. He warned that major increases in jet fuel volume are not possible through more and frequent refueling stops, and that fuel economy is the only way to combat the jet fuel price crisis. Changes that are designed to reduce down output and keep up prices. The main anomalies where price has come

down quickly during the past 10 years is the airline ticket.

Sir William also warned against further attempts of the Universal Postal Union to cut air mail packages to nations at an average of 10 cents. He urged action to bring heavy pressure on the government to force the country to "vote right on air mail packages or "we may as well consider changing to a loss of mail revenue."

ATC System Forces Change in Passenger Ticket Buying Habits

By Glenn Garrison

Reviewing the economic health of international aviation, Sir William noted the following advancements during 1968:

- Passenger traffic showed an increase of 16% over 1967, with 68 million passengers using 64 billion passenger kilometers. Cargo showed a 10% increase last year to 1.3 billion ton-kilometers, continued to increase by 10% for the past three years. Mail increased only 14% compared with 17% during 1966. Night flight in the Pacific sector for 1968 was the North Atlantic where some 700,000 people were served for a 7% increase over 1964.

Sir William and Egmont fat cash

- months of 1968 indicated continuance of this increase and he forecast early attainment of a goal of carrying a 100 million passengers a year since the Airline Association is supporting the entire stimulus around the world.

- Revenue of airlines rose to \$1 billion in 1965, an increase of 15% over 1964. About \$2.3 billion or 75% of the total road was recovered by air passenger traffic. Cargo brought in \$150-\$170 million. Mail was 75%-\$120 million dollars.

- Operating profit rose only \$1 million, reflecting a new method of competition, streamlining money received in government subsidies. Virgin for example will be the first carrier to abandon a \$10 million operating profit for 1969, a \$15 million loss for 1970, and a \$25 million loss for 1971, and a \$35 million operating profit for 1974.

- Sir William noted that profitability profiles of the airline business were made by firms operating in the domestic field and that international airlines were a long way from breaking even. As evidence he cited a \$1 million loss of 10 international airlines for 1969 on total revenue of 51 billion.

Reply to Critics

Sir William ended not at an end of 1968 who have taken more than 1000 flights. Although not mentioned in his speech, his flight were made aboard the Civil Aviation Board and the Congressional subcommittee headed by Rep. Ernestine Board (D-N.Y.) who has charged that IATA

despite enforcement can be evaded and procedural details changed where necessary.

• The airline will operate with greater freedom than intended by the ATC committee. Examples:

- American Airlines has set 6 p.m. on the day before departure as the final deadline for reservations made before noon on that day. American will add to the 6 p.m. time limit given, but can make exceptions up to the ATC minimum. Pan American made after noon on the day before departure are not subject to the ATC requirement, but American will seek to negotiate a time limit for no later than 6 p.m. departure on the same route. This exception will be allowed to pick up their tickets at flight time.

- Eastern Air Lines passengers will not and generally delayed, but first, over about 80% of its routes (and reconfirmation for Florida points and Atlanta City). These varying deadlines will be confirmed, but exceptions beyond the ATC minimum as long as will be made.

- National Airlines since first has gradually extended a requirement that tickets be issued within 48 hours after reservations are made, to 72 hours. The requirement will continue.

- Airlines personnel will continue to follow guides set up by their companies when negotiating purchase on scarce items made well in advance. Starting point for all is the earliest commitment date for the customer.

Among the big firms, American tries to issue policy within three days after confirmation as reservations made more than two days before departure. Eastern will pickup two weeks before departure, while Pan American made the first 48 hours within two weeks pickup at a maximum of three days, as is desired locally. Trans World Airlines leaves the time limit up to be decided at the district level. United Airlines wants tickets picked up a week before departure as early reservations. United and TWA are not



Bristol 173 Tail Change

Bristol 173 helicopter displayed at Society of British Aircraft Constructors' show at Farnborough aircraft exhibition and central fairs. Previous configuration had Vickers fuselage like Bristell Bristell.

going beyond the ATC deadline to late aeronautics.

First alone, the ATC plus will result in negligible cost to the aeronautics, according to their predictions, despite heavier initial workloads through longer conversations between agents and controllers, changes in arrival procedures, and widening of radar purchasing facilities. No additional hiring is reported and none is expected to be necessary. Funding is that the natural increase in traffic will level off as more aeronautics people and controllers become assigned to the new roles. Also, success of the plan in maintaining world areas has precluded any increases and space.

More Slowly

Aeronautics generally are moving slowly in establishing new ticket pricing points as suggested in the ATC resolution. Delaying, after group facilities, third agents' offices, delivery services, expanded use of mail planes and money under guarantee are expected to take most of next summer's work.

The third, delivery, plan is targeted at the remaining 10 hours and 45 minutes of the aeronautics' 15 of 55 of Seattle's 10 hours. Through these services, customers can pay for their return at return banks, according to the proposal.

The ATC plus a smattering more of a problem, and less an immediate advantage for the short-haul carriers than for the longer, high-load carriers. The best carrier where average load may be under 100 is one that flies 100 miles or more daily to support 100 customers to pick the freight to and from ticket offices in advance of flight time. Any significant pickup factor in the smaller locations will result in less short-haul.

Local carriers feel though, that the plan will work to their advantage in the long run. A large percentage of the local aeronautics' customers may be passengers connecting with the intercarriers. If the medium-haul problem is solved, then, the smaller lines will benefit too.

Aeronautics already have made considerable effort to convince the public that the new ATC is for the aeronautics' gain, as well as for the intercarriers. Advertising has been made, however, to travel and holiday markets to travel agents and travel agents to the public.

Letters to the public, according to aeronautics, are intended to inform aeronautics

agents required seven hours of training and familiarization on the new system. This compares with an average of four to five hours per agent for most new procedures according to the aeronautics.

Aeronautics' customer service manual concerning the procedures has not yet been completed. It will be issued to cover various uses and procedures of passengers under the new roles. One of them goes like this:

Arrive—"My Stark, in an effort to solve the aeronautics problem all aeronautics require a ticket to be issued in ad. mode. As far as I need to accomplish is to issue some confirmed ticket, it is impossible for me to hold this reservation for now. Reservations made after 12:00 mid the before departure need not necessarily be supported by a confirmed ticket. They are the rule but when passengers are not supported no issue ticket is advised."

Mr. Stark—"Let me speak to the manager."

Arrive—All available ticketing arrangements, none of which are acceptable to the customer?"

Arrive—"Mr. Stark, we can hold one ticket reservation until 8:00 AM. 2000. Can you purchase this ticket by that time?"

Mr. Stark—"No."

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Arrive—"Mr. Stark, we can hold one

reservation no longer than 6:00 AM, 2000, before 12:00. Is that satisfactory?"

Mr. Stark—"No, I shall get my ticket held before departure, so hold it for me."

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Eastern's Advertising Practices Criticized by Delta and National

Washington—Eastern Air Lines' advertising rates and selling efforts have stirred in Delta Air Lines and National Airlines a complaint filed with the Civil Aeronautics Board.

Delta has accused Eastern of "exploiting, deceiving and misleading" an entire group in advertising its services in being "faster" and at "lowest fare" on routes where the two carriers serve as equals.

The CAB Office is working to resolve the dispute between Delta's advertising claims and Eastern's rates.

The Complainant Office feels that there has been a general improvement in Eastern's advertising practices in the past year, but some undesirable practices are not entirely cleared up.

National's Complaint

National's complaint, asking review of Eastern's rates in a letter to CAB Chairman James R. Duffie.

The Board decided to give National a two-month grace period to file its complaint with the CAB or to the Florida Team one. Under a new policy, it disagreed with the use of the CAB as the forum for the defense of a price below the minimum of a particular service before the CAB or the Florida Team can file a complaint.

After the grace period, National and Delta filed the CAB's complaint with the Civil Aeronautics Board, asking the CAB to challenge the "lowest" label and the DC-7C to challenge "nearest" claims. And Delta pointed out that its DC-8s are scheduled for the same flight times as Eastern's DC-7s.

Eastern also accused Eastern of employing tactics in attempting to get the Florida Chamber of Commerce to take action favorable to Eastern.

Proprietary Job

Eastern propagandists, job has been telling of airline executives people who bear the primary responsibility for selling the plan to the public.

For example, American estimates

that each of its 3,300 reservations agents required seven hours of training and familiarization on the new system. This compares with an average of four to five hours per agent for most new procedures according to the aeronautics.

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CAB, SEC Continue Stock Leak Probe

Washington—Efforts by the Civil Aeronautics Board and the U.S. Securities and Exchange Commission to stop American and Florida/National, both to Wall Street have produced a CAB employee with some digital trick, but with the source of the leak, it will be impossible to know.

Helping the CAB search for the source of the leak, the Securities and Exchange Commission found that Alfred H. Rappaport, a manager of Air Operations' flight division, bought National stock in October, 1967, before the board made its regulations.

When Rappaport's stock position was disclosed, the CAB gave him five days to explain it. Five days later, the CAB issued a statement that, while a hearing on the matter, it had voted to discipline Rappaport and had accepted his resignation under Civil Service regulations.

Rappaport denies any connection with the leak, although he admits violating Board rules with his stock purchases. After the hearing, the CAB and its action was based upon Rappaport's purchase of 1,000 shares of National stock on April 3, 1967, before CAB rules.

The Board and Rappaport both testified that he bought the stock on the authority of an account clerk, as a Washington brokerage firm who told him lots of unusual activity in the stock on the morning of April 3, the day after the CAB decided to give National the New York Stock Exchange in a closed meeting. The account clerk corroborated Rappaport's testimony.

Rappaport denies he had any inside information and says he bought the stock strictly on the basis of the tip he had received from the account clerk. He said he National stock at the market below his assigned price and less than 10 cents.

The Securities and Exchange Commission and CAB are continuing to investigate suddenly activity in the stock, right after the decision in favor of the New England airline, and the chairman of the SEC and CAB have asked the General Director of the Department of Justice to take an interest.

CAA Adopts Care For Storm Clutter

Washington—Plans to popular polarized radar surveillance to eliminate precipitation clutter were announced last week by the Civil Aeronautics Administration.

The program calls for circular polarization of airport surveillance radar (ASR) at existing locations and of equipment yet to be installed at other sites. The modification will enable con-

trollers to continue operation of radar in inclement weather under most all weather conditions.

ASR used by the CAB are presently vertically or horizontally polarized, and usually operating in storm conditions are often lost on the return range or are not available.

ASR at LaGuardia was modified last June. General polarization of ASR at Idlewild, Newark, Boston, Washington, Chicago, and Chicago O'Hare has been accomplished by the end of the year. All ASR are now circular polarized by Air port Instrument Laboratories.

These types of ASR are common in the program—ASR, monopulse, in Brooks, and the later type in CAB are, ARB 2, (Controlled Electronics), and ARB 3 (Gould Electronics), and ARB 4 (Gould), tested in earlier programs. A range and a circular polarized ASR, Atlanta, has a range of 15,000 ft as compared with 5,000 for non-circular polarized radar.

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A SATISFIED CUSTOMER FOR THIRTY YEARS



Mrs. Pittenger's 1888 writing tablet 5

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TO 224 FAIRS IN 32 COUNTIES.

AIR FRANCE

THE WORLD'S LARGEST AIRLINE

THE WORLD'S LARGEST AIRLINE
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SAN FRANCISCO • SEATTLE • WASHINGTON D. C. • NASHVILLE • PORTLAND • TORONTO • TORONTO • VANCOUVER • VICTORIA
PUERTO RICO • FOXES DE FRANCE • FOXES DE PUERTO RICO • CANARIAS • BOCAGUA

Airline Traffic—July 1956

	Revenue Passenger (Billions (\$B))	Revenue Passenger Miles (Billions (B))	Load Factor	M. S. Mile	Excess	Flight	Total Revenue Tens of Billions	Per Cent Revenue to Available Revenue
DOMESTIC TRAVEL								
American	424.418	426,325	48.9%	7,492,716	726,811	3,266,743	42,922,320	48.0%
Delta	319.316	319,316	44.3%	7,492,716	126,416	264,136	41,579,124	44.3%
Continental	239.330	211,517	59.2%	7,492,716	101,407	200,358	40,253,258	44.1%
Delta	150,444	147,444	48.9%	219,630	206,273	120,687	1,444,220	33.2%
United	580,510	571,510	49.0%	7,492,716	101,407	200,358	5,911,281	44.9%
National	132,470	72,160	46.7%	213,610	98,419	166,591	733,152	44.8%
Northwest	98,329	12,975	38.9%	18,338	10,205	33,451	1,027,327	33.3%
Southwest	118,118	118,118	43.9%	42,975	12,024	18,042	4,333,124	49.2%
TWA	200,369	191,369	47.9%	7,492,716	101,407	200,358	1,648,950	91.4%
Trans World	260,280	270,280	46.8%	7,492,716	711,381	4,237,207	45,744,837	38.6%
United	277,374	277,374	48.9%	7,492,716	711,381	4,237,207	45,744,837	38.6%
Western	97,374	97,374	48.9%	206,728	76,147	1,264,819	1,264,819	23.4%
INTERNATIONAL								
American	10,372	8,308	47.9%	17,382	876	203,450	1,264,819	65.8%
Delta	9,072	8,072	44.3%	17,382	7,027	71,176	1,264,819	52.3%
Continental	9,115	7,159	48.9%	17,382	7,027	1,264,819	1,264,819	44.9%
Delta	3,234	3,234	48.9%	8,611	8,611	86,151	823,839	48.8%
Eastern	20,102	61,070	37,8%	40,327	72,905	1,264,819	4,333,124	97.0%
United	14,243	14,243	44.3%	8,611	8,611	86,151	823,839	48.8%
National	11,544	10,708	44.9%	4,455	4,455	50,545	50,545	71.8%
Trans World	7,400	7,400	44.9%	4,455,001	87,380	797,343	4,455,001	71.8%
United	12,389	10,354	44.9%	7,492,716	711,381	4,237,207	797,343	71.8%
LOCAL SERVICE								
Air America	9,127	8,217	79.6%	20,839	4,664,908	1,026,819	41,614	41.6%
Air West	10,027	10,027	44.3%	4,455,001	4,455,001	1,264,819	1,264,819	37.8%
Pacific	29,055	19,816	76.4%	1,214,855	1,214,855	1,264,819	1,264,819	91.5%
Delta Aeronautics	120,480	120,300	70.9%	136,139	12,001	3,266,743	1,444,220	65.8%
Pacific Northwest	22,246	12,016	70.9%	12,024	12,024	1,264,819	1,264,819	97.0%
Trans World	21,246	12,016	44.9%	12,024	12,024	1,264,819	1,264,819	97.0%
United	12,389	10,354	44.9%	7,492,716	711,381	4,237,207	797,343	71.8%
REGIONS								
Alaska	8,610	6,610	49.9%	8,342	12,343	2,887	880,148	61.7%
Arizona	16,414	13,860	49.7%	9,636	1,764	7,339	709,411	59.4%
Carolina	9,030	8,030	44.3%	9,636	5,379	1,264,819	1,264,819	100.0%
Central	17,431	4,431	44.9%	18,331	18,331	27,726	27,726	76.0%
Lake Central	10,701	1,444	96.0%	2,846	10,811	18,331	18,331	100.0%
Midwest	87,190	8,950	48.9%	5,000	6,000	8,345	406,977	47.5%
North Central	10,701	1,444	96.0%	2,846	10,811	18,331	18,331	100.0%
Oregon	4,401	4,401	50.0%	9,331	16,244	7,142	478,806	24.3%
Pacific	34,327	5,654	61.9%	13,411	13,411	8,345	410,810	61.1%
Southern	15,343	14,343	41.6%	9,331	9,331	18,331	210,329	77.5%
Southwest	22,246	2,123	44.9%	7,492,716	4,237,207	797,343	797,343	100.0%
Trans West	18,493	6,331	38.0%	12,507	8,444	11,262	808,844	33.8%
West Coast	19,443	9,805	44.9%	9,576	9,576	5,435	909,744	45.7%
MANUFACTURERS								
American	42,344	8,654	60.9%	3,244	112,761	473,819	37,279	37.2%
Trans Pacific	20,700	3,041	55.4%	701	10,827	988,800	988,800	100.0%
CRASHED LINES								
American Southwest	7,203	28,814	99.2%	27,007	747,747	747,747	747,747	73.1%
Delta	8,440	37,153	99.4%	82,000	82,000	3,266,743	8,266,743	74.4%
Delta	6,580	34,700	99.2%	82,000	82,000	3,266,743	4,444,837	87.4%
MISCELLANEOUS								
New York Airways	3,430	57	99.9%	809	1,411	847	4,704	56.4%
Los Angeles Airways	1,419	47	91.2%	3,817	1,092	1,264,819	1,264,819	97.3%
Mountain Air Service	—	—	—	2,612	2,612	2,612	2,612	100.0%
SAFETY								
Delta Airlines	7,000	3,717	38.7%	40,730	82,000	82,000	82,000	84.4%
Delta Coast	4,327	888	44.0%	3,608	8,706	8,706	8,706	44.9%
Caroline	3,048	204	58.7%	2,400	312,500	312,500	312,500	93.7%
Delta Air Lines	9,793	403	33.7%	3,103	2,327	2,327	2,327	38.2%
Pacific Northwest	14,356	31,104	69.1%	79,440	344,000	450,837	450,837	49.7%
Trans Alaska	—	—	—	30,004	1,270,479	8,616,848	8,616,848	99.9%
New Mexico	3,440	3,207	38.4%	30,004	1,270,479	8,616,848	8,616,848	99.9%

¹Not available. Compiled by AERATION from public records in the Civil Aerostatic Board.

BALLISTIC MISSILES

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For some time, Burroughs has been participating in the U. S. Air Force Ballistic Missiles program in the field of guidance. The program consists of two intercontinental ballistic missiles, Atlas and Thor, plus an intermediate range missile, Thor.

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Electronic Tube Division, Hicksville, N. Y.
The Field Company, Inc., Rochester, N. Y.



Looking to future expansion, Burroughs invites inquiries from qualified engineers.

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SAS Staggers Seats

Staggered seats will be introduced on International Airlines System DC-7C North Atlantic Global Express flights this month and next month on Los Angeles to Copenhagen trans-polar route. Design staggers seats 41 in. from center line about straight-line front-to-rear legroom. Centered width of all seats is 18 in., standard cushion width 15 in., and total leg of center line is 37 in.

CAB Revives C & S Rate Case

Washington—Civil Aeronautics Board has added a new twist to the stalled Chicago and Southern Mid-Atlantic Case by suspending the record for hearing on the airline's rate for international transportation between Dec. 16, 1952, and July 31, 1953.

The Chicago and Southern case is the proceeding in which the Supreme Court stood on its trans-Atlantic airfare decision of 1951. The Court declared CAB policies on error and held that as airline's domestic excess profits should offset against subsidies needed for international operations.

The case on the C & S will run for the period Nov. 1, 1946, to July 31, 1951. In 1951, the CAB set a great period rate from Nov. 1, 1946, to Dec. 15, 1951, and a final rate from there on. At first time, the Board followed its policy of not using excess domestic earnings to offset international subsidy.

The Postmaster General took the decision to court and the Supreme Court found CAB policy in error and remanded the case to the Board for further action.

The remanded case was reviewed. In the CAB, and a Board committee found subsidy should be reduced by \$700,000 of excess domestic earnings and which no parts to the proceeding has challenged.¹²

C & S rate set in 1951, just before all argument on the remanded case, the CAB issued the possibility of re-opening the international rate for 1948-51 period. Now the Board has decided to reopen that aspect of the case for the period of July 31, 1952, to December 31, 1953, on the whole proceeding.

Debtors contended that the Board does not have the power to reopen the international rate, but the CAB rejected this, airline's argument. The Board voted to renew the rate at 10% of actual experience rather than the fixed rate on which it was originally based.

The CAB and debtors failed to reach actual operating results during the period 1948-51, but the CAB set a rate with a 30% return on investment for the period. At first time, the Board followed its policy of not using excess domestic earnings to offset international subsidy.

Domestic carriers and debtors and it is clear that the Board is a writer of paper and an writer of law, should not accept the international rate case. This added.

"We conclude that it is unorthodox, unfair to the carrier, to the investing public and to the carrier's creditors to review a rate which has been closed for approximately five years and which no parts to the proceeding has challenged."¹²

Ozark Recommended For Quad Cities Route

Washington—Ozark Air Lines last week won support of Civil Aeronautics Board committee for its route bid in the Quad Cities, Iowa.

Ozark is invited to operate a new route between Des Moines, Iowa, Midway, Ill., and Minneapolis-St. Paul, Minn., via Cedar Rapids, Iowa, and Rochester, Minn. Boarder Joseph L. Feltzervice recommended that Ozark be allowed to operate the route for three years or up to 60 days after decision in the Seven Cities case, whichever comes first.

Pittsburgh and the three between Ogdensburg and North Central Airlines, the two applicants, was difficult, but he found that the route integrates better with Ozark's system. The examiner said Ozark should provide more non-convoy service and generate more non-convoy traffic than would North Central.

Bad Approach Blamed In Eastern Crash

Washington—Civil Aeronautics Board has decided that Eastern Air Lines Constitution crashed in Jacksonville, Fla., last December because the pilot applied power for a non-existent landing.

The accident occurred at 3:41 a. m. on Dec. 23 when Miami-Boston Flight 642 was on final approach for a visual final approach to Jacksonville.

The approach was made in foggy weather with 3,000 ft ceiling and visibility 300 ft., and the Constitution crashed about 6 miles from the runway, killing the crew of five and all 12 passengers.

The CAB found evidence that power had been applied just before the crash and said probable cause of the accident was that it "wasn't approach procedure cause to land in present the result during landing.

Reports of inaction, jet aircraft flying very low over the Jacksonville airport at the time of the crash were unverified by the Board, but it was concluded that no such aircraft were in the vicinity at the time.

SHORTLINES

• British European Airways will begin flying to Dublin under a new up-to-date inter- signed with Aer Lingus. BEA will start London-Dublin, Birmingham-Dublin and Manchester-Dublin services in April, and Aer Lingus will have rights to operate between Dublin and



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ROLLS-ROYCE AERO ENGINES LEAD THE WORLD

Bernard Tardieu, Donald L. Aspinwall, Zephry and Remy von Melleben, SIA's captain in charge of Air France has been from 40% to 15%, but Luc Dugay, BEA chairman, will remain on the board of directors of the British airline.

► **British** has purchased eight B-777 for the use of the government and the British Development Corp. The aircraft will be used primarily in Britain and used to transport food and other goods within the country.

► **Capital Airlines** inaugurated four new Viscount flights last week between New York and Chicago. All four flights are roundtrips scheduled for 2 hr., 50 min. Capital now has 15 Viscounts.

► **International Air Transport Assn.** has produced three new intra-fleet labels to be used for existing, possible or single cargo flights after Oct. 1. The preferred labels consist of a standardized package of four words: "New labels for marking dangerous items were introduced earlier this year.

► **Lithuanian** opens a new route to Tel Aviv this week and plans to extend the route to Tokyo by 1981.

► **Mohawk Airlines** has managerial offices at Glen Falls, N. Y., with two round trip flights connecting the city with Boston, Syracuse, Rochester, Buffalo and other northeastern points.

► **North Central Airlines** claims a local online passenger record with 56,467 passengers handled in August.

► **Singapore's** airport traffic increased 30% in the last half of the year and is expected to total more than 300,000 passengers for the full year.

► **Southern Union** has signed permission from Aeroflot to fly over West German cities to open new routes to West European cities. Such permission may come from Britain, France and the United States under terms of the Gomme peace treaty.

► **Svensair** is doubling the use of its New York reservations department to handle increased transatlantic traffic. Svensair carried 58,961 passengers in July, 1976, more than last year.

► **Tokyo International Airport** will be improved at a \$155 million government program designed to prepare the field for jet operation. A new 10,000 ft runway will be operational by 1980 and present 5,000 ft runways will be lengthened 1,000 ft. Tokyo also will get new control tower equipment and parking facilities.

AIRLINE OBSERVER

► **Sonic** will begin its trans-Caribbean flights to the U. S. about May for a very short time but to three months. It will visit the main bases of all major airlines. The first three production airplanes will be delivered to Air France in 1978 and probably will be placed in passenger service on Air France routes in the Caribbean. By that time the French airline may have completed its arrangements for service out of Miami to its possession in the area. Nine Caravelles are scheduled for delivery in 1978. Sonic plans to have out four aircraft per month. If orders are sufficient, it will double that amount. Should the Caravelle attract a large number of orders, Sonic has signed with Republic Aviation Corp. for the establishment of a second production line in the U. S. with a capacity of up to seven aircraft per month.

► **United, Northwest and Northeast Airlines** are reportedly interested in the Convair 880 medium-haul jet transport and at least one of the companies will place a sizable order within the year. Northeast's interest in the British aircraft is being kept confidential (AW Sept. 10, p. 47). George Carlson, the airline's president, called a special meeting of the board of directors after the return from a goodwill trip to England to allow them to comment on many apprehensions of his visit with the British people which, he said, found "interesting and enlightening". Carlson emphasized, however, that no commitments were made during the trip.

► **Convair 880** jet transport will sell for \$3,850,000 including revenue freight and cargo options. If 350 also reach 250 aircraft, Convair plans an across-the-board rebate to airlines that will bring the cost down to \$3 million.

► **Lockheed Aircraft** is launching a frantic drive to expand the market for its 104-4G, 104-9B and 104-9A transports. Company's top sales officials are convinced there is a big potential for high-performance, piston-engine transports despite the coming of turboprops and turboprops.

► **Capital Airlines** estimates the Rolls-Royce Avon 19 turbojet engine, powering the Convair 880, will have logged 100 million hours by the time the first Convair 880 is delivered.

► Two new turboprop transports are under development in England. Among Wright's has started work on a prototype of a medium-sized, twin engine turboprop (as compared to single-engine) freight-passenger operation and Sud-Ouest Aviation is developing a 40-passenger turboprop version of its Trident 2.

► **Aeroflot Airlines** and **British Air Transport**, rival domestic operators in Australia, are planning a merger that will bring an end to the one-world era with (AW Sept. 3, p. 47). It is understood that the proposed merger is strongly supported by Australia's National Airways. ANA, already a large shareholder in British, may seek a majority voting right by buying more shares in hopes of killing merger negotiations.

► **Air Traffic Control Assn.**, representing approximately 2,000 controllers, has challenged the Civil Aeronautics Administration to date or confirm a Civil Service Commission statement by Thomas Philip Young that the CAA had agreed to a CSEA wage agreement. The CAA's position in the dispute of wage payment (AW Aug. 27, p. 38) ATCA says its members were led to believe that the CAA had agreed the standards which formally went into effect Sept. 1. No action has been taken, however, pending CAA-CSC review.

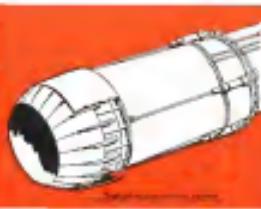
► Acting Civil Aeronautics Administrator James Pele has announced his intention of continuing policies and programs of the late Charles Lowen without change. Lowen died on Sept. 5 (AW Sept. 10, p. 49).

► Two Civil Aeronautics Administration officials are in Europe to study production and technical matters with the Lufthansa Co. of Germany, ramifications of VOR spots that will be installed on international routes under the jurisdiction of International Civil Aviation Organization.

Vital accessories for the fastest fighters



AFTERBURNER ACTUATORS—the Lockheed F-104G Starfighter world's fastest fighter plane has four Aeroprodacts actuators on the afterburner for pitch, yaw and roll control. Designed for the most difficult aircraft control operations, these hydraulic actuators are manufactured to an ordinance or perfect motion, providing instant, sensitive



control of the afterburner nozzle. This unusual feature of redundant synchronization provides precision positioning by automatically shifting position within the hydraulic tubing in the event of one line failure. The other three actuators on the afterburner are similar levers which prevent the jet from losing control completely in the event of hydraulic failure.



WING INCIDENCE ACTUATORS—the Chance Vought F7U Cutlass world's fastest Navy fighter plane, showing its unique two-position incidence wing in 10° position for takeoff. From sheer normal flight position. First operational plane to incorporate this principle, the F7U Cutlass

is Aeroprodacts self-locking hydraulic actuator which controls the angle of attack of the wing. Changing the wing angle permits the Cutlass to land level with the runway of the carrier deck, giving the pilot better visibility and permitting use of shorter, lighter landing gear.



RAM AIR-DRIVEN GENERATORS

in the Douglas A-4D Skyhawk—Aeroprodacts ram-air-driven generator is the power source for the aircraft's radio and electronic equipment. Located beneath the fuselage, the light-weight unit (23.5 lbs.) can be up to speed in less than 1/100 second and develops 1.7 KVA @ 11,000 R.P.M. to operate radio, lights, instruments, trim tabs and elevators. It has successfully



performed in emergencies and has been dropped and array four on flight test. Using a single blade pitch changing mechanism, the unit generates its output frequency within 10% of the rated value, over a very wide range of ram-air density and load conditions. The unit also has the ability to low voltage to generate power for sensitive mechanisms.



AIR-DRIVEN HYDRAULIC PUMP—the North American F-100D Super Sabre is equipped with an Aeroprodacts air-driven hydraulic pump which produces sufficient hydraulic power for flight controls in case of either engine



or hydraulic failure. This lightweight ram air pump is mounted back of the cockpit, where air from engine air inlet ducts can be directed by the pilot to drive the pump in emergencies.

Position is the keynote of our work at Aeroprodacts. Turbo-propellers and other essential aircraft components are produced by engineers experienced in designing equipment to meet specific requirements of our customers.

Aeroprodacts linear actuators—pushed on a wide variety of uses—offer many unique advantages: low weight, high strength, precise positioning, self-locking, high-temperature operation, compactness and reliability. New rotary solenoids have high torque-carrying capacity with near-zero backlash for control rotation of missiles.

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Republic Turns to Dual Actuator Controls

By Robert H. Cashman

Panama City, N. Y.—Republic Aviation is retrofitting approximately 1,500 F-105s with a simplified control actuator system and is planning to use an advanced version of this new system in its forthcoming F-105 fighter-bomber.

The system is called a tandem actuator system. It uses two independent hydraulic loops working side by side on the same control surfaces. Such movements cause both systems to set in motion to make the control surfaces respond.

Both loops are used so that they are capable of carrying the primary control surfaces alone.

Automatic Safety

Advantage of this system from the pilot's viewpoint is that he doesn't have to do anything upon the failure of one of the systems since a stand-by nature, as well as a ability to return and automatically in place.

Advantages can also be had position in this case the problem was to insure that the two systems were fully working in synchronization so that failure of one would insure only that the other smoothly continued to translate pilot control movements into control surface deflections without any unnecessary loss of continuity.

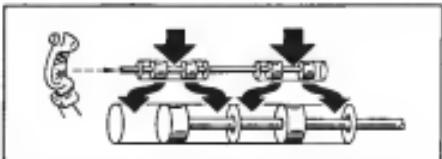
The tremendous has been accomplished in putting both the servo valves and the servo actuating piston on the same shaft. Thus they are shown mechanically coupled. Other means of synchronization from the ground are possible. For example, North American uses a tandem system without direct mechanical connection on its F-100 but the virtue of Republic's system is that mechanization is built in but doesn't open interlockage and no further refinements in the field are necessary.

Simplicity Gained

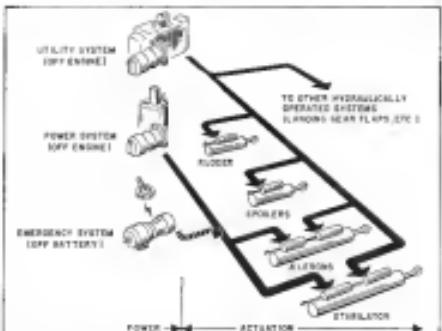
"The most noticeable aspect of the tandem actuator system is that it emphasizes an improvement in the original system," said William J. Shugart, Republic design safety engineer, and "Aerospace module 57 components including valves, switches and relays have been eliminated in addition to numerous limit and safety strings. This results in greatly simplified maintenance, greater reliability and ease of operation."

Thus it contains less overpressure single-throw oil switch to integrate the system. Power and utility contacts have been made completely independent with each system supplying itself to each half of the tandem actuators on the stabilizer and ailerons. Rudder and spoiler are operated by single oil system, separated from the other system.

In the F-105 the stabilizer and ailerons are degassed at pressure controls the motions would be fit to the ailerons. The spool were added in an attempt to increase high speed control roll rate. The pilot has no difficulty in using the rudder, especially



REPUBLIC's new control system is built around tandem actuators for the main surfaces. These actuators are composed of two inputs servo valve and piston units but with both servo valves and piston on the same shaft to insure maximum synchronization. Note only back sides are working, but each has the capacity to handle most of the load alone.



TWO HALVES of the main important controls, stabilizer and ailerons, are powered by two independent hydraulic loops. One is the aileron system which is for the stabilizer and aileron ailerons. The other is fed from the engine's ground utility system and feeds the rudder boost and the high speed roll spoolers as well.

on the tandem system, Republic has gone to a single large L-10000 actuator, for there is very little to do except put the oil in.

Checkouts are positive, the ailerons other work as they should. There is tandem and chord control and neutralization to delay roll-off (roll to the pilot's detriment) as compared to the previous Republic system.

Bonus of 125-130 lbs weight saved goes along with the simplicity. All electric components have been eliminated except for the motor driving an emergency hydraulic pump and one



Cameras Track Crusader

Chinese Vought F-8 Crusader, ready for liftoff on sweep of Naval Ordnance Test Station, China Lake, Calif., (top) was tested by two E-110 cameras (bottom right) of southern end of course for transonic speed run. One of eight cameras cameras (bottom left), never mounted in Crusader, enough the F-8 (right) in the F-8F-105 with one. Aeronautics efforts made remote measurement possible.





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► Engineers concerned with the pumping of liquids at high altitude will be interested in getting good performance at high altitudes where low inlet pressures are encountered.

► A pump which will work at low altitudes, therefore, must be reliable when they consider the rapid pressure changes which shock and turbulence which occurs during descent and landing after a long flight.

► Gerotor pumps are efficient at high altitudes and therefore are frequently specified for that service. A simplified view of a Gerotor gear pump, the Gerotor pump, is shown in the accompanying cutaway detail drawing. The more Gerotor has seen less teeth than the outer and the smaller teeth spacing, the more efficient it becomes in pumping the fluid from the inlet to the outlet port (see Figure 1).



The relative motion between the inner and outer gears is such that it causes the outer shafts to be unserviceable if slowly stopped and reversed in 20 minutes.

The inner shaft port is always closed as it passes the outlet port. This provides a steady vibration-free flow regardless of altitude pressure changes.

Thus, turbulence is minimized and foaming is avoided, centrifugal pumping being maintained at all altitudes.

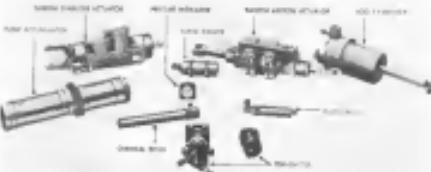


► **GEROTOR** pumps are simple and compact in design, reliable and have been used in many applications due to the smooth, quiet operation of the Gerotor which maintains high suction at high pressure. Further, this maintenance feature is important in the economy of the heating load principle.

► **Jet engine lubrication and service** are common Gerotor pump applications. In addition they are frequently specified for helicopter applications and for aircraft applications for electronic equipment in aircraft and guided missiles.

► **Technical data** is available and your engineer is invited to write.

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GAIN IN SIMPLICITY is shown by comparing old and new pump components.

After drawing landing when the cylinder is retracted.

The stabilizer actuator is as designed that only half of the cylinder cylinder has 95% of the capacity of the complete actuator. Except as the most severe emergency failure of one system will have an noticeable effect on the longitudinal control of the airplane. Furthermore this limitation will only affect the amount of control deflection, as governed by the hinge moment, and will not affect the rate of control deflection, as governed by the center of gravity movement.

Because the control takes block the fluid at both sides of the actuator cylinder, a loss of hydraulic power resulting from engine seizure will not permit the surfaces to move as long as the control stick is not moved. Therefore the emergency pump must be turned on before engine seizure before any control manipulation is attempted.

In the aileron actuator, only half of the cylinder has only 50% of the load output of the old system to a reduction in aileron control power will be experienced if one servo fails; however, the loss of control capacity will much limit the performance of maximum response maximum large amounts. There will be no change in control forces as in the case of deflection at low large amounts.

Lest Stick

Besides of the complete independence of the two systems no single breakdown of one can result in the loss of both wings.

The only single occurrence which can have this result is engine seizure due to a much low diode current, or gas flame out. For a low-disk one there is an auxiliary hydraulic pump powered by an electric motor and feed into the boost actuator. In the event of a single pump to eliminate the need

Pilot's Comments

Lie. Bialas, Republic test pilot, who first flew the tendon system Oct. 26, 1955, said the pilot control system is the best. Although the artificial feel was adjusted to the same forces in the previous system, the flying forces seemed lighter.

Jar. Bialas, Republic's assistant director of flight operations, later tested in F-105F as one of the three test batches and could find no difference. Republic says that Lt. Tompkins pilot who have flown the F-105F with the tendon system agree that no difference in flight control response can be noticed regardless of which hydraulic system is operating.

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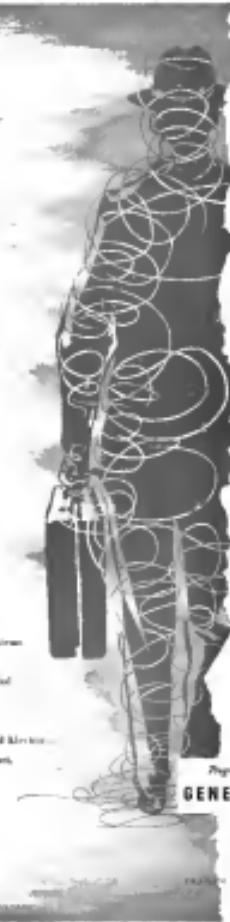
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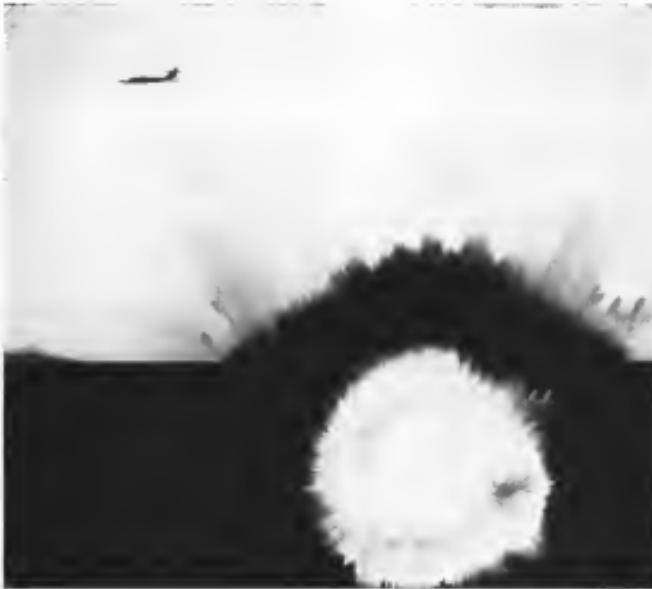
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the previously unavoidable control surfaces would be 'loose'. The pilot might find himself in an uncontrollable situation without engine thrust before he had a chance to turn on the emergency pump. However, a flight check of that possibility indicated that there was enough time either to turn on the emergency electric pump or to eject.

Tendons: Dog-wheel

A poor name be paid for this simplicity. One part of the price is that since the emergency system is tied into the main power system through a check valve, a loss failure in the power half of the main hydronic system will result in loss of the emergency system as well.

The electrically driven emergency pump has the same capacity as that at the original installation so there will be the same degree of control. It is actually possible to fly combat on the emergency pump. Repulsive emergency pump.

The T-485 goes one step further as emergency system simplicity, and has the pilot work a lever to push a ram air turbine out in the airtank from the side of the plane to drive the emergency

Another part of the price to be paid is the higher machining tolerances that must be held. Servo speed valves have always required a very high grade of machining. Keeping the diameter of a long dual servo valve so that both sections will really work together presents an even greater problem.



Sea Venom Pull-Ups

Assault team of Royal Navy Fleet Air Arm Squadron 890 flew straight up in North 21 Sea Vixen fighter, Lt Cmdr P. G. Young, squadron commander at team leader. British checkered-top trade, planes are marked with white on flying boom wings.

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Test Firing

At Holloman Air Development Center for testing Convair F-102 missile flying, center. Note photo of belly of F-102 has been reshaped to carry missile has shown. Photo taken in Higher Firing in true missile. Test firing also is done in air at target distance over 120 mi. Holloman range.



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braided element braided against the screw

As a secondary safety locking action a spring-loaded sleeve on the screw shank holds the screw arm securely in the notch on the thrust clevised braid until the fastener has been tightened up into braided.

To increase the fastener's ability to take high driving torque Zekhakian has incorporated the Aviation Screw Co.'s metric hexagon. For use in aircraft engine areas, Phillips-head cross-shaped driving slot (AW-Jolt 9, p. 65). Then the final tightening should be even greater than a comparable steel conventional pressurized fastener.

As a companion product for the high strength fastener Zekhakian has brought out what he feels is an appropriate apex fastener—turn "Pezelok" fastener concrete. Since manufactured under an exclusive license by The Scott Manufacturing Co., Worcester, Mass., AW-Jolt 11, with the exception of the cross slot, both fasteners will be manufactured by Zekhakian's Inc., V. V. Zekhakian Aircraft, Ltd., in Stratford, N.J.

**Air Industry Growth
 Shown By Census**

United States aircraft industry production in 1958 was estimated at \$3,549 million, an increase of 48.9% over 1957, preliminary data based on a detailed industrial census by the U.S. Department of Commerce reveals. Industrial statistics were collected only recently and complete information is expected to be available soon from the Bureau of Census.

The Bureau gives the increase in terms of value added, which at the value of work done by the industry for use of materials, supplies, fuel, electricity and labor estimates. The report covers all forms of manufacturing of assembled complete aircraft, helicopters, gliders and lighter-than-air vehicles and components during manufacture, conversion and capital. Other segments of the industry, such as engine, propeller and equipment builders are not included in this report.

Census data on value of work done also includes that of secondary production, contracts and repair work and scrap repair. The total value was \$3,549 million. The value of primary value was over \$1,545 million and aluminum and other various pressure to systems and \$620 million in aircraft parts, engine parts, guidance and armaments.

Figures were collected by the Bureau under legislation providing for a new set of censuses every five years, with the next one due in 1963.

**Supercharger Raises
 Helicopter Altitude**

Los Angeles—Problems of altitude and altitude that were limited helicopter operators are being overcome by a supercharger developed by McCulloch Motor Corp., and adopted in the Sikorsky CH-3 and CH-5C helicopters.

Applied to the CH-5 using a General Motors engine model GV-4320-CT1, it provides increases in altitude performance by maintaining rated sea level horsepower (1800) up to 7,800 ft. CAA tests passed having rating performance increased 4,900 ft. to 8,600 ft. at maximum gross weight.

Service testing of the craft has been increased through supercharging to 11,000 ft. Altitude of some 10,000 ft. have been attained.

Rate of climb capabilities of the aircraft improved, with approximately 400 ft. per min. reported possible at 16,000 ft.

Hot weather helicopter operation improved, and only over hot weather non-supercharged flight characteristics, but over uncomplicated performance at standard temperature.

Supercharging is believed by a pilot to be sensed on the tail rotor drive, with a two-position pilot operated clutch.

Total of 25 hr. of flight testing by the supercharged helicopter resulted in no significant service difficulties.

**Germans Order Home
 Built Military Planes**

Bonn, Germany—West Germany Defense Ministry ordered \$11 million in plane from Germany firms. The cost includes 1000 MiG-17 fighters, 2000 MiG-19 fighters, 300 MiG-21 fighters, 1000 MiG-23 fighters, 1000 MiG-25 interceptors, 1000 MiG-27 bombers, 1000 MiG-29 fighters, 1000 MiG-31 fighters, 1000 Su-24 bombers, 1000 Su-25 ground attack aircraft, 1000 Su-27 fighters, 1000 Su-30 fighters, 1000 Su-33 fighters, 1000 Su-34 bombers, 1000 Su-35 fighters, 1000 Su-37 fighters, 1000 Su-38 bombers, 1000 Su-39 fighters, 1000 Su-40 bombers, 1000 Su-41 fighters, 1000 Su-42 bombers, 1000 Su-43 fighters, 1000 Su-44 bombers, 1000 Su-45 fighters, 1000 Su-46 bombers, 1000 Su-47 fighters, 1000 Su-48 bombers, 1000 Su-49 fighters, 1000 Su-50 bombers, 1000 Su-51 fighters, 1000 Su-52 bombers, 1000 Su-53 fighters, 1000 Su-54 bombers, 1000 Su-55 fighters, 1000 Su-56 bombers, 1000 Su-57 fighters, 1000 Su-58 bombers, 1000 Su-59 fighters, 1000 Su-60 bombers, 1000 Su-61 fighters, 1000 Su-62 bombers, 1000 Su-63 fighters, 1000 Su-64 bombers, 1000 Su-65 fighters, 1000 Su-66 bombers, 1000 Su-67 fighters, 1000 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Bendix AND ONLY **Bendix**



Offers a Complete Ignition System for JET ENGINES!

The most significant reason why the Scintilla Division of Bendix has long been recognized as the leader in aviation ignition is that Bendix Scintilla designs, engineers and manufactures every component of the ignition system.

Obviously, components designed

to work together give more efficient performance and require less attention in original installation or later service.

This is why Bendix and only Bendix offers the industry a complete jet ignition system, including, not only the ignition unit, but igniter

plug leads, igniter plugs and coated brushes as well.

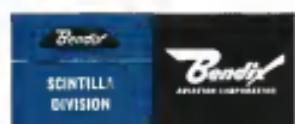
There just isn't any question about it—you get not only the best, but all of the best when you specify Bendix for your complete jet engine ignition requirements.



Scintilla Division of **Bendix**
Aviation Corporation

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Rocket Test Vehicle

Bendix Aircraft Ltd. rocket test facility, one of several built to meet varying test requirements for rocket nose cone cases produced by Bendix, a branch line ground range. Bendix rocket rocket test concluding the vehicle to separation speed after which nose cone attitude under takes over. Tested is using motor cases for solid propellant boosters 120 ms altitude range nose cone vehicles using high tensile sheet steel welded by Argon Arc process. Bendix is a manufacturer of other materials for nose cones, among them semi-insulated glass fiber. Plastic materials are incorporated in design of some nose cone types, and Dimetac (plasticic semi-insulated insulation is sometimes used as top layer).



LEADERSHIP results from...

VISION

Working closely with the Army, Navy and Air Force on many diversified projects, Bendix is pioneering future flight research and development programs. High-speed aircraft, all-weather aircraft, space exploration, satellite and advanced VTA, STOL designs.

DEVELOPMENT

Highly diversified including aircraft for research, space for research.



PRODUCTION

The Army's H-13C utility helicopter



ENGINEERS: When the opportunity comes with an industry leader in an ideal California location



PHOENIX, CALIFORNIA

GRAPHITAR® is the main shaft seal (CARBON-CENTRIFUGED) PRATT & WHITNEY J57 turbojet

• Boeing's B-52 Intercontinental Bomber, the striking arm of our Strategic Air Command, is powered by eight twin-spool axial flow turbojet engines manufactured by the Pratt & Whitney Aircraft Division of United Aircraft Corporation, East Hartford, Connecticut. These turbojets are in the 10,000-pound thrust class and in engines of this caliber, complete dependability is vital. One of the components of the J57 is a GRAPHITAR shaft seal employed on the carbine main shaft which, naturally, is turning at high speeds. The GRAPHITAR seal also easily withstands the maximum operating pressure developed in the engine. The data in the box to the left shows on the opposite page (approximately 55 psi) are for pressure balance and sealing. This Main Shaft Seal is just one of several GRAPHITAR seals used in the J57 engine. GRAPHITAR parts can resist such severe physical conditions because they are strong, self-lubricating, and practically inert. GRAPHITAR has excellent wearing properties and cannot be corroded by most chemicals. Where the application is rough, and complete dependability is required, GRAPHITAR is the engineering material to specify.



in the
engine



• From the B-52 to the atomic submarine, from automobile pumps to automatic toasters, GRAPHITAR is solving the problems of industry in fields of high temperature, pressure, and corrosive materials. The unique engineering material is composed under extreme pressure and fired at heat over 4500°F. It can be formed or cut into complicated shapes and ground or soldered in close as .0001" for seals, bearings, bases, piston liners, and many other parts. GRAPHITAR is self-lubricating . . . can be used where only carbon or water are present. It is high-tight, strong, durable, chemically inert, and is normally unaffected by extremes of heat, pressure, or temperature.

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Bulletin No. 30



THE UNITED STATES

GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION, SAGINAW, MICHIGAN



happy birthday,

"TRUCULENT TURTLE"

In September, 1948, the U.S. Navy, anxious to test its first-pair-of-bridles, and the 3rd "Turtle," and headed for the Land Down Under.

Starting right
from Peshawar, Pakistan,
with JATO'd (and RATO'd)
gallons of gasoline and
a frayed safety chord,

"The Turtle" flew

non-stop without
refueling to Colombo,

crossing a distance

of 11,238 miles, in 31 hours
and 42 minutes. Nonstop
safely, promptly started
the record-breaking plane

"The Truculent Turtle."

LOCKHEED

AIRCRAFT CORPORATION

LOS ANGELES, CALIFORNIA

Look to Lockheed for Leadership

Suprise was endowed with advanced design characteristics—that permitting evolutionary improvements in subsequent P/T flights, at lower cost to the U.S. Navy. A total of 44 Navy crews for "Turtle" is a tribute to their dependability, versatility and all-weather ruggedness—apt to Lockheed's leadership in the design and production of long-range patrol aircraft.

This historic Australia-Ohio flight is still the world's non-stop record. On this, the 30th Anniversary of the remarkable flight of "The Truculent Turtle," Lockheed salutes the gallant Navy pilots and crew members who wrote that historic and enduring page in aviation history. Like all aircrafts designed and built by Lockheed, the original

Rocket Manufacturer To Expand Facilities

Huntington-Coupe, Inc. of Monrovia, Calif., subcontractor to General Electric Rocket Co. for the third stage rocket motor assembly of Mariner's Vanguard satellite project, has changed its name to Cooper Development Corp.

Name change recognizes the company's concentration in the field of rocket and missile systems and electronic instrumentation development.

Cooper plans to build a division of five facilities and additional manufacturing facilities to house a large engineering and technical operations and to service the space industry. For production of the French ASR and WAST radar systems, Cooper also designs or builds telecommunication stations, test grade radar ports, microstrip components and waveguide-waveguide transition systems.

Name change is effective Sept. 15 and does not indicate a change of management.

Aeroquip Corp. Acquires Lead Control Company

Aeroquip Corp., Indiana, Mich., has purchased General Lead Control Corp., Pasadena, Calif., designer and manufacturer of aircraft and control and test equipment. Sales of General Logistics, which has 50 employees, are expected to reach the \$1 million level within a year.

Two new products now being introduced are a special rope lock and a self-tensioned webbed bridle for strap assemblies.

WHAT'S NEW

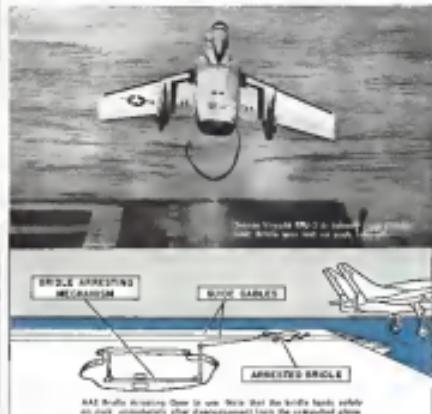
Publications Received

• *U.S. Army Automatic Data Reduction, Technical Ed., Gov. Document Faculty, PB 121181*—by C. E. Hill and K. R. Kienzle, Arnold Engineering Center, U. S. Air Force—Available from DTIC, U. S. Department of Commerce, Washington 25, D. C. \$7.27 27 pp.

An automatic data reduction system capable of obtaining, storing, computing and presenting results of a wind tunnel test in one continuous operation is described.

• *The Electron Spectrograph at Titusville Marsh and Alton, PA 121186*—by E. M. Deffen and A. Tefte, Spectrograph Laboratory, Inc., and J. L. Miller, Wright Air Development Center, U. S. Air Force—Available from DTIC, U. S. Department of Commerce, Washington 25, D. C. \$2.95, 100 pp.

NO MORE LOST BRIDLES...



THANKS TO ALL AMERICAN HIGH-CAPACITY BRIDLE ARRESTERS

In catapulting ships from the decks of aircraft carriers, each flight used to result the loss over the side of the combatants.

The U. S. Navy has now installed All-American's 15-Capacity Bridle Arresting Gear on all aircraft catapults equipped with states-of-the-art catapults now used for naval.

These are another engineering product that spotlights All-American's dynamic leadership in design, development and testing of new and improved equipment for the Armed Forces.

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In the field of space technology as an industry, AD Optical is actively engaged in both the development and production of optical systems for combat, rapid reconnaissance, navigation and bombing, systems for long range and guidance and other optical devices.

Here at one of America's most modern instrument plants, facilities for design, model work and production are located at our convenient sugarloaf plant in the area of American Optical Company, Southbridge, Massachusetts. We offer complete design, engineering, analysis and electronic responses for lens design, implementing the Keene facility in research and development.

If you have a problem involving the design or production of microscopes, photomicroscopes or optical components, just write or phone. An AD Optical engineer will be happy to discuss your problem with you.

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Company Defense Products
Facilities and capabilities.

WHO'S WHERE

(Continued from page 23)

F. E. Hogen, design engineer, Marconi Electronics Division, National Aircraft Corp., Burlingame, Calif.

James D. Eason, Jr., corporate manager, aircraft division, Boeing Aerospace Co., Seattle, Wash.

Willie L. Dibble, public relations area supervisor, AC-300, F-104 Division, General Motors Corp., Fort Worth, Texas.

Elli P. Fuchs, director sales manager (Europe E1), Continental Air Lines, Inc., Holley B. Dickenson, manager in the passenger division, Continental International Corp., Teterboro, Calif.

Robert J. Marshall, sales manager and Leonard Larson, chief engineer, Defense Electric Co., Portland, Ore.

R. D. Pidgeon, purchasing agent, and **Eric L. Thompson**, manager, technical support, Hughes Aircraft Co., Los Angeles, Calif.

Capt. Richard J. H. Clark (USN ret.) manager, Military Logistic Division, Service Dept., Wright-Armstrong Division, Goodyear-Wright Corp., Woonsocket, R. I.

Alphonse W. Spivak, Ann manager of the staff of the Defense Information Service of the National Bureau of Standards. He will be in charge of the Bureau's Material Electrical National Laboratories.

Joseph J. Poggiaro and **Walter J. Howard**, new names on the professional staff of Hughes Research Corp., Los Angeles, Calif.

Herb R. Jones, supervisor, Liquid-Propellant Division, Bausch & Lomb Aviation Corp., Tokorozawa, N. J. He succeeds W. G. Moulder who is retiring.

Dr. Michael G. Fazio, dentist of record, Army Ordnance Commission Products Division, Army Manufacturing Corp., University, Ohio.

Frederick G. Strode, operations manager, Bellinger Corp., Waltham, Mass.

Joseph R. Grotto has joined the staff, Chemical Division, of Atlantic Research Corp., Mechanicsburg, Pa.

John L. Brinkley, personnel director, Vick Co., Inc., Belmont, Calif.

Ed M. Cuddeback, senior project engineer, Avco Electronics Products, Inc., Bedford, Calif.

John G. Murray, assistant director of nuclear planning, Bellcore & Western Airlines.

Matthew H. Purce (Gates & Crellin) research fellow, NASA Langley Flight Propulsion Lab, Hampton, Va., Ohio is transferred to Avco Electronics Products.

Donald G. McRae, rental division sales manager (Division One), and **William Poll**, sales, auxiliary division sales manager, Army Ordnance Division, Farnell, Inc., Atlanta, Ga.

Robert W. Hallinan, design engineer representative, San Francisco, Calif., Eclipse-Pioneer Division, Bausch & Lomb Corp., White Plains, N.Y.

Raymond E. Phillips, plant representative of Kofler Systems Corp., and **Robert W. Johnson**, general sales manager, A. G. Kelly, divisional head and products division, and **Robert D. Melton**, personnel and industrial relations manager, Cal Eastern Corp., Los Angeles, Calif.



Actual test firing of a modern Rocketdyne rocket engine at the Field Test Laboratory in the Santa Susana Mountains.

The mightiest engines ever built will drive America's long-range missiles

Today's rocket engines are the most powerful in the world... and the power they develop is helping to make our nation's long-range guided missile program an operational reality.

Already ROCKETDYNE engines are being supplied for the U.S. Air Force SM-64 NAVFIRE long-range, surface-to-surface guided missile

...the RIMMERS surface-to-surface ballistic missile of the Army Guidance Corps... and for many other large guided missile projects.

For the past 10 years ROCKETDYNE has been working closely with the Department of Defense, producing its rocket engines as required, and delivering them on time. New and more powerful

rocket engine designs for tomorrow's more effective missiles are in constant development.

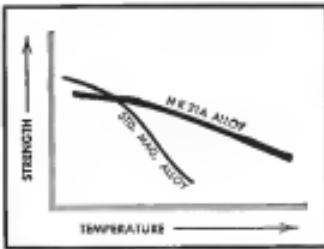
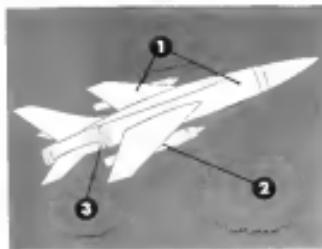
ROCKETDYNE: Investigate the career that starts you in rocketry. Please write: ROCKETDYNE, Personnel Manager, Dept. W-32, 6633 Canoga Ave., Canoga Park, Calif. ... 20 minutes from Los Angeles in suburban San Fernando Valley.

ROCKETDYNE 

A Division of
North American Aviation, Inc.

BUILDERS OF POWER FOR OUTER SPACE

NEW DOW MAGNESIUM ALLOYS CRACK HEAT BARRIER!



Now suggested for a broad range of aircraft structures and aircraft, the new Dow magnesium alloys are available in the form of (1) sheet or plate, (2) extrusions, (3) forgings.

Maintenance of strength at high temperatures is illustrated by the chart. Performance data on the new alloys at elevated temperatures can be obtained by request.

High temperature magnesium alloys are available to lighten aircraft and missile structures

Once again the barriers for aircraft structural design have been widened. Dow has developed a series of high temperature magnesium alloys which are already in production use on aircraft, missile and engine structures. These alloys show advantages at temperatures up to 100° F. Limited test data on properties up to 1000° F. are available for some of these alloys.

The new alloys have precious metals because of their good combination of modulus and properties, including every enough, at temperatures. Shop characteristics include good formability and weldability.

One of the available alloys is the magnesium thorium composition, HK31A, which is manufactured in rolled and cast form. Under development is a similar alloy for extruded shapes and forgings. HK31A sheet and plate are available from stock and from custom mill delivery schedules in standard sizes from 0.030" to 2".

The new magnesium alloys by Dow should be considered for your high temperature requirements. Contact your nearest Dow sales office or write THE DOW CHEMICAL COMPANY, Magnesium Sales Dept., MA 3004, Midland, Michigan.

you can depend on DOW MAGNESIUM



**The right people
with the right facilities
produce the
right solutions**



Other representative installations are found in the Electronic Systems Division, Buffalo Engineering Laboratory, Room 83, B. C. Price, Manager; Buffalo Oscilloscope, M. C. Jones, Manager; Buffalo Engineering Laboratory, W. F. Foy, Manager; and the Electronic Components Division, D. P. Peacock, Product Engineering Manager.

Components of Authoritative Communication Systems

"Packaged"
to deliver top performance —
anywhere

The "PACKAGE" can do whatever, **anywhere**, **anywhen**, high-performance aircraft, and deliver effectively in America's defense. It is an electronic communication system. Designed, engineered, and "packaged" for maximum weight, the experience behind these unique packages is the key to optimum performance under extreme conditions of humidity, altitude, shock, vibration, and temperature fluctuations.

Engineers in the Buffalo Engineering Laboratory of Sylvania's Electronic Systems Division, this highly advanced elec-

tronic system employs subminiature circuitry, insulation, and printed circuit in a package which is itself subminiature. Despite its complexity of design and performance, it is engineered for quantity production in the Division's Buffalo plant.

In all of Sylvania's Electronic Systems Division installations, the right people work with the right facilities, within a sound management environment. That is why they have earned the right to solve a variety of problems, and bring much such important contributions as the fields of aviation electronics, guided

missiles, communications, communications, radio, television, and control systems. Whether the problem is military or industrial, Sylvania's business is to come up with solutions unknown that are producible.

In addition to its Buffalo Engineering Laboratory and manufacturing facilities, the Electronic Systems Division has installations at Waltham, Mass., and Mountain View, Calif., staffed with technical and management personnel, and backed by Sylvania's extensive resources in the electronics field.

SYLVANIA IS LOOKING FOR ENTERPRISING ENGINEERS

Sylvania has many opportunities in a wide range of defense projects. If you are an enterprising and capable worker, you are invited to consider

Edward W. Dore, Manager of Personnel, Electronic Systems Division, Sylvania Electric Products Inc., 190 First Avenue, Waltham 54, Mass.

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LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY



Buffalo Electronic
Communication
Laboratory and Manufacturing
Facilities
occupy over 150,000
square feet of buildings
in Buffalo and feature a 175
Cubic Foot Vacuum Chamber.



in order development by the company. The Wimberlite was developed by Sylvania's Research Center, Bayside, N. Y. The work was suggested by three Naval Research Laboratory scientists, Neil L. Davis, Isaac W. Folke, Jr., and Roger E. Davis, who were associated with the project.

THE FILTER CENTER

► **Says of The T-33A-Douglas DC-8** fighter weight 1,200 lb. of electronic equipment, costing \$140,000—more than the entire cost of a previous DC-3. Douglas Engineer R. H. Johnson reported during the recent Western Electronic Convention (Wesco). Other interesting figures on DC-8 systems included:

- 1,200 lb. of wire and insulation for wires
- 4 to 5 m. of wire.
- 26 radio systems and 28 antennas.
- Three of the antennas are control loops and two are omnidirectional (DC-8 is the only aircraft in the world whose actual dry weight is only 14 lb. compared to 49 lb. required for a bush airplane, but one separated). On DC-8, one sq. ft. of power line area is equivalent to 1,700 lb. of actual weight.)

► **Collins ATC Transponder**—Collins Radio is building approximately 50 air traffic control transponder beacon for service to 10 selected airways. Unit weight about 3 lb.

► **New Models**—Tetron-Sylvania has announced a new line of seven subminiature television cameras under a military contract. The guided missile cameras are available for evaluation by companies engaged in missile work, include:

- SN-1773A: Sharp cutoff pentode
- SN-1773B: Semi-cutoff RF pentode
- SN-1775A: Audio amplifier. (This tube recently has been released to civilian specs as Type 6780)
- SN-1777A: Audio power pentode
- SN-1776A: Medium-Mu single triode with relatively high G_m for ground plane use up to 150 mc
- SN-1802A: Medium-Mu double triode
- SN-1801A: High-Mu double triode

► **Sylvania-Rand-IBM Agreement**—Sylvania Radio Corp. and International Business Machines Corp. have entered into non-exclusive licensing agreement to exchange rights to manufacture punched card accounting machines and electronic data processing machines under patents and patent applications as es-

**this hunter is 55 pounds
lighter.**



**with TI transistorized
intercom**



TI **TRANISTOR** engineering helped Lockheed trim 55 lb. of dead load from the P2V-7 sub-hunting Neptune — by transistorizing part one system — the 14-channel intercom. In addition to saving weight, safety and reliability were increased while maintenance and power draw were reduced.

Well within MIL-T-5400 for general performance, MIL-T-5422C for extremes, and MIL-T-611B for conformance, the TI-built system has a 2000-hr. mean-time-to-failure, an exceptionally long service life. Signal response is instantaneous without need for warm-up. There is negligible power drain on standby and negligible heat dissipation while in use. The system takes power directly from a 38-Vdc line and uses less than 6 watts per station.

This is one example of Texas Instruments **transistor** engineering now being applied to radio, radio, radar, sonar, infrared, and other systems for communications, navigation, search, fire control, and missile control. Continuing progress over a quarter century has resulted in over a third of a million sq. ft. of engineering and manufacturing facilities... soon to be doubled... located in an excellent disposal area.

For fundamental design and development... for manufacture of reliable systems that save weight, space, and power... for scheduled commitments delivered on schedule... call on TI application engineers. Write to Apparatus Division...

TEXAS INSTRUMENTS
INCORPORATED
4000 LENNON AVENUE DALLAS 5, TEXAS

translate slow
... into pounds per hour
at a glance!



TIME-FUNCTION TRANSLATOR

Applications:

- ✓ Gears per minute
- ✓ Gears per hour
- ✓ Gears per hour
- ✓ Gears per minute
- ✓ Gears per hour
- ✓ Gears per second
- ✓ Gears per minute
- ✓ Gears per hour
- ✓ Total Count of Gears or Points
- ✓ Tachometer Applications
- ✓ Gear Frequency Measurement
- ✓ Many Others

Transforming these into weight or frequency for an engine analysis is just one of the many uses for the new Model 202A TIME-FUNCTION TRANSLATOR. The 202A provides accurate direct read-out of thousands of operations by translating one function of time into another, function of time. It eliminates the need for time counters, scales, graphs, charts, etc. The 202A has been designed to be interconnected with the Model 2024 Time Function Translator (shown).

Write for complete information and detailed specifications on the Model 2024 Time Function Translator 708447. .

SPECIFICATIONS:

Performance Ratings	1.000,000 pulses per second
Input Synchronizers	1.000,000 pulses per second
Output Frequency	1.000,000 pulses per second
Input Impedance	1.0 megohm
Output Impedance	1.0 megohm
Time Ranges	0.001 to 100,000,000 seconds and more
Frequency Ranges	0.001 to 100,000,000 Hz and more
Accuracy	± 0.01% of reading
Response Time	0.0001 to 0.001 sec.
Power Requirements	115 VAC, 60 Hz, 2000 watts, 100,000 watts red heat
Dimensions	14" x 24" x 20"
Weight	100 lbs.
Options	1000,000 pulses per second
	1000,000 pulses per second

4000111 Div. of Gen. Elect. Co., Schenectady, N.Y., N.Y., N.Y.

Computer-Measurements Corporation
3525 Vinehurst Avenue, North Hollywood, Calif. Dept. 991

revenue as of Oct. 1, 1955. Based on IBM's greater production of these and similar products, we will pay \$1,000,000 for eight years in a credit against production royalties, when which we further estimate will be due. Two years after signing upon procedures for settling patent infringement now pending in U.S. Patent Office. Anti-trust violations and patent infringement actions brought earlier by the companies have been withdrawn.

■ "Talking Beams"—An Associate has received first order for two of its "Talking Beams" (IAW Dec. 12, 1955, p. 61) from Army Signal Corps. The talking beams automatically open, lower, extend, reposition and close with VHF radio remote control, then bring to station by tape-controlled voice.

■ New AEW Radar—Navv has ordered new higher power surface early warning search radar, employing "see through principle" from General Electric's Light Military Electronic Equipment Dept. (LMERD). Contract for pilot production amounts to approximately \$1 million. GE sign

■ Automatic Tension Tester—Development of an automatic "Go-No-Go" type test set which can measure flight characteristics of a balanced FM/AM missile launching motor in less than two minutes has reported at the recent Wings in Los Angeles (Howard A. McGill, United Electrotechnical Corp. and F. S. Klaas, Nudenberg Aircraft, coauthored the paper). The device checks motor frequency and power to preset tolerances, then checks the frequency and amplitude of each vibratory channel. If a particular value of each subcarrier is not well-defined, comparing signal to a reference in the subcarrier channel. When tester finds a fault, it identifies the channel and removes for repetition.

■ New Broadcast Wave Oscillator—Bell Telephone Laboratories has developed broadcast wave oscillator operating in the 3.5 to 7.2 millimeter wavelength region, capable of delivering 2 to 20 milliwatts. G. E. Thompson reported at Wings.

■ Voltron Gears West—Following preliminary tests in Alton, Ill., by the Army Corps of Engineers, a gear system called Voltron system is being tested at Chatsworth, Calif. For Basic (Odeh) for extreme speed reduction in aircraft. After two months of testing at Ft. Detrick, near Boston, Corcoran says that Voltron has demonstrated its ability to "triple the capacity of main exports throughout the country."

AVIATION PROGRESS with G-E aircraft motors

NEW G-E AIRCRAFT GUN MOTOR DEVELOPS TWO HP PER POUND FOR 10 SECONDS!

POWER PLUS HAS BEEN PACKED INTO THIS COMPACT 16 POUND, 400 CYCLE MOTOR WHICH DELIVERS 25 HP FOR A 10 SECOND PIRING INTERVAL. NEWLY DEVELOPED INSULATION SYSTEM PROTECTS AGAINST INTENSE HEAT. DOUBLE MOTOR DESIGN PROVIDES HIGH STARTING TORQUE AND EXCELLENT OPERATING EFFICIENCY—PERMITS UTILIZATION OF SINGLE OR DUAL POWER SOURCE.



GE HERMETIC MOTOR PARTS LESS
THAN 6½ INCHES IN DIAMETER
DELIVER 25 HP CONTINUOUSLY
TO COOL AIRLINERS!

HERMETIC MOTOR PARTS WEIGHING ONLY 10 POUNDS DELIVER
25 HP CONTINUOUSLY AT A SPEED OF 3,200 RPM.
TWO-POLE, 400-CYCLE POWER PACK CONSISTING
OF STATOR, ROTOR AND SHELL IS DESIGNED
TO POWER AIRBORNE COMPRESSOR.

DIGITAL COMPUTER DETERMINES BEST MOTOR DESIGN IN SECONDS!

DAYS OF CALCULATIONS BECOME SECONDS WHEN
G-E AIRCRAFT MOTOR DESIGNERS PUT THIS COMPUTER TO
WORK IN DETERMINING OPTIMUM MOTOR DESIGN IN THE
FAIREST POSSIBLE TIME! AFTER PRELIMINARY DESIGN WORK
HAS BEEN COMPLETED, COMPUTER CAN THEN BE INVOLVED
IN ASSURING BEST—AND FASTEST—POSSIBLE ANSWER
TO YOUR MOTOR REQUIREMENTS.



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THESE ARE ONLY A FEW EXAMPLES OF G-E'S
CONTINUING DESIGN LEADERSHIP. FOR HELP
ON YOUR AIRCRAFT MOTOR PROBLEMS, CONTACT
YOUR NEAREST G-E AIRPLANE SALES OFFICE:
GENERAL ELECTRIC CO., SECT. 434-5
SCHENECTADY, N.Y.



ZERO unison 4-hour G-E test profile, still obscured in the early morning darkness before launching, represents more than a decade of research and development.

THESE G-E CAPABILITIES ARE AVAILABLE TO



BASIC RESEARCH



COMMUNICATIONS



HYPERSONICS



METALLURGY



MATHEMATICS



THERMODYNAMICS

At General Electric, George F. Metcalf reports:

New Department to Help Solve Complex Defense System Problems



GEORGE F. METCALF, is General Manager of General Electric's new Special Defense Projects Department, located in Philadelphia, Pa. Mr. Metcalf has had extensive management experience in the military electronics field, both in Government service and in the General Electric Company's Electronic Division.

Realizing the increased complexity of some of the nation's current defense system problems, General Electric has formed the Special Defense Projects Department. The new department will act as a Company focal point for large, highly complex missile projects. Headquarters for the new department will be located near Philadelphia, Pa. The new department has responsibility for large defense systems that require the combined research, development, and manufacturing resources of many of General Electric's operating departments and laboratories.

Manned by a highly skilled engineering and development staff, the Special Defense Projects Department relies upon

General Electric operating departments and laboratories for many specialized phases of its defense projects.

The Special Defense Projects Department is making significant contributions to America's defense program by fusing the wide range of specialized talents of General Electric on highly complex defense system problems. Section 224-4, General Electric Co., Schenectady 3, N.Y.

Interested, G-E's Special Defense Projects Department is actively regarding the staff of highly skilled engineers and scientists. If you have a background of successful, creative work in your field and your interests coincide with ours, write or call:

Mr. George Metcalf, 310 Chestnut St., Special Defense Projects Department, General Electric Company, Philadelphia, Pa.

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

NEW SPECIAL DEFENSE PROJECTS DEPARTMENT

and then we built



This 7 pitch, 28.1264" pitch diameter lateral gear for the Sikorsky S-55 Main Transmission.

This HARD (Rockwell "59C") gear is cut after heat-treating to master gear standards:

- .00005" per inch maximum lead error
- ± .00005 - .00007 involute error
- .00002" tooth spacing tolerance
- 69 RMS finish

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NEW AVIONIC PRODUCTS

Components & Devices

- Subminiature ceramic capacitors. Series 2800C maintain 98% of rated capacitance over temperature range of -55°C to 125°C. Capacitor is rated 200



working volts d.c. Available in film sizes ranging from 0.0031 to 0.01 and .0150. Vaco Electronics, Solar Crv., 2534 So. Highland Ave., Los Angeles 36, Calif.

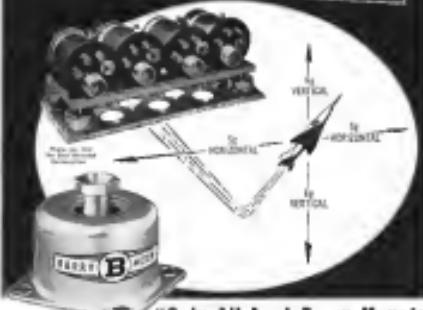
- Miniature clutch/brake, employing dry powdered metal. Model No. 10 clutch provides proportional control, is rated 50 in./lb at 5,000 rpm, and has torque inertia of 1.83 gm-cm². Speed of 10



spins in 2 shallow-dish fixed-rate ball end bearings, slip rings and no metal bearings. Model 10 holds his higher torque rating. Electronic Mechs. Corp., Inc., Greenwich, Conn.

- X-band rotary joint, Model 812501/561, band band waveguide chapter can handle 100 kw peak power for that purpose, 150 kw for extended periods. Uses two precision ball bearings to prevent loss of alignment during rotation. VSWR is less than 1.10 over frequency band of 4.4 to 5.6 GHz. Lattice Industries, Compagnie Div.

PROVED...
protection under high-g
SUSTAINED ACCELERATION
of the new **F-10 CLASSIFIED***



"Only All-Angl Barry Mounts gave effective isolation..."

* One of the newest and fastest fighter aircraft now flying flies in electronic equipment such a missile class, where accelerations are turned on or off, that maximum deformations bottom out MIL-spec mounts — making vibration protection all.

But in this same aircraft, All-Angl Barry Mounts protect the power units of Lockheed's fire-suppression system, maintaining vibration isolation under sustained accelerations up to 1g vertical and 1g horizontal.

The pilot's life — and the success of his mission — basically depend on the integrity of his fuel-gauge readings! And those readings depend on the protective reliability of the vacuum tubes and circuitry in the power units.

- In any mounting position
- Through every attitude of aircraft or missile
- Under sustained high-g acceleration

Barry's new Models 8100 in Redwood, California, offers fast, on-the-spot design and prototype service, and production of special systems.

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SALES REPRESENTATIVES
IN ALL PRINCIPAL CITIES

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"When I want cable
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I call
Packard Electric!"



Huge production gives important advantages to bulk cable customers of Packard Electric

You don't have to sacrifice a thing or compromise legal aviation safety standards to get cable at a price that's right.

From pre-World-War-I times, through the tremendously concentrated defense production schedules to the present, Packard Electric has always made reliable high-quality aviation cable available to aircraft and engine manufacturers. Many times our engineers have worked closely with leading avionics firms to develop wire cable to meet the exacting standards of the industry.

The resultant know-how has given us the ability to assure uniform, high-quality cable production of relatively low cost. Our huge production capacity tops 7,000,000 feet of cable a day and is the biggest in the aircraft cable manufacturing industry. This volume makes possible additional advantages to bulk-cable customers without a reduction in quality standards.

Yes, the right price has to include uniform, high-quality, advanced cable engineering and dependable delivery

... all available when you take advantage of Packard's years of experience in aviation cable manufacture backed by the industry's most extensive and modern production facilities.

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Vernon, N.Y.

• **Minister**: hermetically sealed power supply, operates from 25 to 450 volt input, provides 115 V, 400 cps, and 720 V, 25 cps output with a 15-foot lead rating.



Our weight is only 1.75 lbs. in weight
15 lbs. Efficiency is approximately 85%.
Hycon Manufacturing Co., 2961 E.
Colombia St., Portland, Calif.

• **Teflon**: jacketed cables, which also employ Teflon for dielectric, are now available in six types with impedances of 50, 75, 75, 90 and 110 ohms. Federal Telephone & Radio Co., Components Division, 310 Kingsland Road, Chelmsford, Mass.

• **Digital counter** for use with multimeter performance has hermetized case for precise adjustment of pot, with three dial capable of direct positioning in 1/40 increments to provide read out to one part in 2,000. Electro-Data



can be used with precision ohmmeters or voltmeters. For more information on "Digital", call, state Maxon Instruments Div. Dr. W. L. Marion Corp., 47-37 Astoria Place, Long Island City, N.Y.

Instrumentation

• **Measure pressure transducers**, Type 5551, measuring 1 m. dia. x 1 m. long, is available in four models: "flat", "shock tube", "bellows" and "in-pulsebalance", covering range of pressures

Know when flow is low...
WITH

REVERE FLOW SWITCHES



SPECIFICATIONS — F1210 Flow Switch (Type 6)
Flow: 1.5 GPM
Weight: 0.70 lb.
Operating Pressure: 70 PSI
Temperature Range: -65°F to 200°F

Know when a fuel line runs dry... this Revere flow switch flashes a pilot light. Uses a venturi to create differential head during fuel flow to fill float cavity; this causes float and magnet assembly to activate hermetically sealed Glaswitch. Air replacing fuel in the float switch cavity reverses switch action. Small size... low pressure drop.

SPECIFICATIONS — F1210 Flow Switch (Type 6)
Flow: 3000 PPH minimum
Weight: 1.25 lb.
Operating Pressure: 20 PSI
Temperature Range: -45°F to 160°F



Designed for aviation fuels. Conforms to MIL-F-5037, MIL-F-5014 and MIL-F-2616 as well as applicable requirements of MIL-E-5072 and MIL-P-412.

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ABOVE THE OCEANS

The FJ-4 — unique, fastest climb, most maneuverable and longest ranged FURY of them all — has completed its carrier suitability and fleet indoctrination tests. This latest addition to the Navy's operational squadrons is a product of North American's Dallas Division. Here, faster more effective aircraft are in continuous development — as they are in North America's Los Angeles plant, birthplace of the F-100 SUPER SABRE and the F-86 SABRE JET. This ability to develop tomorrow's aircraft — in quantity, on time, and at lowest possible cost — has made North American Aviation a major supplier of advanced aircraft for our country's defense.



ABOVE THE CONTINENTS

Even before the close of World War II, North American was at work in the next technological world of guided missiles. One of today's major results of this pioneering is the SM-64 RAHVAD INTERCONTINENTAL MISSILE. North American has developed guidance systems, electronic navigation and flight control systems . . . as well as airframes and rocket power . . . Our most important Air Force project, North America's work on the RAHVAD and other weapons systems is now creating long range missiles to fit a high priority need in our nation's defense. North American Aviation, Inc., Los Angeles, Division, Canoga Park, Pacific Bell Telephone Co., Los Angeles, Calif.

NORTH AMERICAN AVIATION, INC.

Engineers write for details regarding challenging positions now open.



new airline makes most of

THIS space-saving design

CAPITAL AIRLINES is proud of its spanking new turbo-prop Viscounts. The finest aeronautical and electronic know-how has been employed in the development of this amazing new aircraft.

This advanced thinking is apparent, too, in the Viscounts' air conditioning system. For the heart of the system they selected a Joy AXIVANE Fan... and used to full advantage the inherent space-saving characteristics of this unique self-contained design.

Because Joy AXIVANE Fans can be installed in *any* part of a plane they may be located in any part of a plane that

has ducting. Light-alloy magnesium and aluminum construction save weight but give the greatest vibration-resisting and shock-absorbing strength.

FROM 10 CFM TO OVER 5000 CFM is the range of savings of Joy AXIVANE Aircraft Fans... in weight from 10 ounces to 30 pounds. Joy Axivane Aircraft Fans are working, today, in Braniff, North American, Douglas, Martin, and Sikorsky Aircraft. You can put them to work in yours, too. For details write Joy Mfg. Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada), Laval, Que., Canada.

Write for FREE Bulletin 126-59

JOY AXIVANE AIRCRAFT FAN DESIGN IS SO EASY TO DESIGN IN AIRCRAFT AND HELICOPTER SYSTEMS THAT NO STANDARDIZED AIRCRAFT DESIGN IS REQUIRED. DESIGN INFORMATION AVAILABLE ON REQUEST.

Consult a Joy Engineer

JOY AXIVANE FAN

JOY
WORLD'S LARGEST MANUFACTURER
OF VANE-AXIAL FANS

output of 100 kw and is operable up to Type 4735 fixed frequency tube.

• Transistor wave tube amplifier, Model 510A, has output of 10 kw over 2 to 4 kHz band and a VSWR less than 2.1. When amplitude modulated by grid, amplifier operates from 0 to 100 mc. has 5 rf modulated pulse rate (max) at maximum power output and a



pulse delay of approximately 15 microseconds. When phase-modulated by 90°, amplifier has bandwidth from 10 cps to 10 mc and requires 30 volts input for 100 deg phase shift. Power consumption is 100 watts. Model 510A, Rock, model costs \$1,999. Winstech Corp., 870 Broadway St., Railroad City, Calif.

Computers & Data Processing

• Computer for use with X-Y plotters, type 3100 from punched paper tape obtained directly from output of a digi-



ital computer, extract demand data for plotting. Computer accuracy is 0.1% Lissocorp, Inc., Glendale 1, Calif.

• General purpose modulator, Models GPS-6 and GPS-12, operates at speeds 3,000 times faster than real time. Wide variety of linear and non-linear operating characteristics and special function generators are available. GPS Instrument Co., 811 Boylston St., Boston, Mass.

• Diode function generator, Type DFG-100, free-standing, capable of generating sine or square waves, has one with analog compander. Flexible switching arrangement allows the number of segments in each channel to be varied as desired. During generated Built-in calibration circuit permits quick

Better way to keep tab on thirsty engines



Bendix FUEL FLOW TOTALIZING SYSTEM

TYPE 9130

makes news because it...

- is designed for commercial and military jet and piston aircraft—both multiple and single engine.
- Reports fuel consumption from 400 to 2,200 PPH* for individual engines (Type 37100 indicator)... and total consumption for all engines (Type 37102 or 37103 indicator).
- Provides system accuracy of 2% individual total and 5% total rate.
- Is pressure tested to 1000 psi.
- Has low pressure drop—only 1.0 psi.
- Is simple to install and service.

*1000 hours available

Development of new, faster—and more—commercial and military aircraft makes it even more important than ever to have complete and accurate indication of fuel consumption. This is because of the need for better fuel economy, better performance and more generally developed for heavier and more powerful—greater needs for full details check with PIONEER CENTRAL DIVISION, BENDIX AVIATION CORPORATION, BIRMINGHAM, ALA.

PIONEER CENTRAL DIVISION, BENDIX AVIATION CORPORATION, BIRMINGHAM, ALA.

Pioneer-Central
division

Bendix
aviation corporation

rockets give helicopters extra lift

Reaction Motors, developer and producer of rocket engines and powerplants systems for guided missiles, aircraft, and ordnance-type rockets, is an important participant in the OMAR program. With Marquardt Aircraft, the West's largest jet engine research and development center, and Olin Matheson Chemical, RMI contributes to a continuous joint technical effort to advance the science and technology of supersonic powerplants and fuels.

The OMAR program illustrates the integration of effort by a well-coordinated industrial team in the weapons systems concept in action. This combination of technical and production skills, products, services, and corporate strength has the capacity to provide an effective team to those corporations for the common defense.

Exposure, plasma, physics, production and test specialists - a wide variety of fascinating careers await you in this unique system. For information, write OMAR Employment Officer at the company nearest you.

They can top nuclear weapons increase the payload of the Marquardt HMX-3 helicopter up to 150 per cent. Having started their Vergence tail and the first of the first four heavily loaded Marine helicopters, design, manufacture, testing, supporting responsibilities will be shared. HMX-3, shock-coupled, mounted only on four main landing gear, will permit HMX-3, loaded-with-rocket, helicopter climbout strength up to 1000 GPH. The first flight of the aircraft is due this fall when plans will be finalized. Developed by Reaction Motors, Inc., for the Navy, HMX provides maneuvering power for take-off and emergency landings.



Marquardt Aircraft Company
San Diego, California

Olin Matheson Chemical Corporation
New York, New York

Kearfott Industries, Inc.
Denville, New Jersey



attain from a single plot of the function without using external plotting tools. Kevco Instrument Corp., 215 East 45th St., New York 17, N. Y.

New Avionic Bulletins

• **Marquardt inertial navigation systems** now available. Model 1000, 1000-A, 1000-B, 1000-C, 1000-D, 1000-E, 1000-F, 1000-G, 1000-H, 1000-I, 1000-J, 1000-K, 1000-L, 1000-M, 1000-N, 1000-O, 1000-P, 1000-Q, 1000-R, 1000-S, 1000-T, 1000-U, 1000-V, 1000-W, 1000-X, 1000-Y, 1000-Z, 1000-A1, 1000-B1, 1000-C1, 1000-D1, 1000-E1, 1000-F1, 1000-G1, 1000-H1, 1000-I1, 1000-J1, 1000-K1, 1000-L1, 1000-M1, 1000-N1, 1000-O1, 1000-P1, 1000-Q1, 1000-R1, 1000-S1, 1000-T1, 1000-U1, 1000-V1, 1000-W1, 1000-X1, 1000-Y1, 1000-Z1, 1000-A2, 1000-B2, 1000-C2, 1000-D2, 1000-E2, 1000-F2, 1000-G2, 1000-H2, 1000-I2, 1000-J2, 1000-K2, 1000-L2, 1000-M2, 1000-N2, 1000-O2, 1000-P2, 1000-Q2, 1000-R2, 1000-S2, 1000-T2, 1000-U2, 1000-V2, 1000-W2, 1000-X2, 1000-Y2, 1000-Z2, 1000-A3, 1000-B3, 1000-C3, 1000-D3, 1000-E3, 1000-F3, 1000-G3, 1000-H3, 1000-I3, 1000-J3, 1000-K3, 1000-L3, 1000-M3, 1000-N3, 1000-O3, 1000-P3, 1000-Q3, 1000-R3, 1000-S3, 1000-T3, 1000-U3, 1000-V3, 1000-W3, 1000-X3, 1000-Y3, 1000-Z3, 1000-A4, 1000-B4, 1000-C4, 1000-D4, 1000-E4, 1000-F4, 1000-G4, 1000-H4, 1000-I4, 1000-J4, 1000-K4, 1000-L4, 1000-M4, 1000-N4, 1000-O4, 1000-P4, 1000-Q4, 1000-R4, 1000-S4, 1000-T4, 1000-U4, 1000-V4, 1000-W4, 1000-X4, 1000-Y4, 1000-Z4, 1000-A5, 1000-B5, 1000-C5, 1000-D5, 1000-E5, 1000-F5, 1000-G5, 1000-H5, 1000-I5, 1000-J5, 1000-K5, 1000-L5, 1000-M5, 1000-N5, 1000-O5, 1000-P5, 1000-Q5, 1000-R5, 1000-S5, 1000-T5, 1000-U5, 1000-V5, 1000-W5, 1000-X5, 1000-Y5, 1000-Z5, 1000-A6, 1000-B6, 1000-C6, 1000-D6, 1000-E6, 1000-F6, 1000-G6, 1000-H6, 1000-I6, 1000-J6, 1000-K6, 1000-L6, 1000-M6, 1000-N6, 1000-O6, 1000-P6, 1000-Q6, 1000-R6, 1000-S6, 1000-T6, 1000-U6, 1000-V6, 1000-W6, 1000-X6, 1000-Y6, 1000-Z6, 1000-A7, 1000-B7, 1000-C7, 1000-D7, 1000-E7, 1000-F7, 1000-G7, 1000-H7, 1000-I7, 1000-J7, 1000-K7, 1000-L7, 1000-M7, 1000-N7, 1000-O7, 1000-P7, 1000-Q7, 1000-R7, 1000-S7, 1000-T7, 1000-U7, 1000-V7, 1000-W7, 1000-X7, 1000-Y7, 1000-Z7, 1000-A8, 1000-B8, 1000-C8, 1000-D8, 1000-E8, 1000-F8, 1000-G8, 1000-H8, 1000-I8, 1000-J8, 1000-K8, 1000-L8, 1000-M8, 1000-N8, 1000-O8, 1000-P8, 1000-Q8, 1000-R8, 1000-S8, 1000-T8, 1000-U8, 1000-V8, 1000-W8, 1000-X8, 1000-Y8, 1000-Z8, 1000-A9, 1000-B9, 1000-C9, 1000-D9, 1000-E9, 1000-F9, 1000-G9, 1000-H9, 1000-I9, 1000-J9, 1000-K9, 1000-L9, 1000-M9, 1000-N9, 1000-O9, 1000-P9, 1000-Q9, 1000-R9, 1000-S9, 1000-T9, 1000-U9, 1000-V9, 1000-W9, 1000-X9, 1000-Y9, 1000-Z9, 1000-A10, 1000-B10, 1000-C10, 1000-D10, 1000-E10, 1000-F10, 1000-G10, 1000-H10, 1000-I10, 1000-J10, 1000-K10, 1000-L10, 1000-M10, 1000-N10, 1000-O10, 1000-P10, 1000-Q10, 1000-R10, 1000-S10, 1000-T10, 1000-U10, 1000-V10, 1000-W10, 1000-X10, 1000-Y10, 1000-Z10, 1000-A11, 1000-B11, 1000-C11, 1000-D11, 1000-E11, 1000-F11, 1000-G11, 1000-H11, 1000-I11, 1000-J11, 1000-K11, 1000-L11, 1000-M11, 1000-N11, 1000-O11, 1000-P11, 1000-Q11, 1000-R11, 1000-S11, 1000-T11, 1000-U11, 1000-V11, 1000-W11, 1000-X11, 1000-Y11, 1000-Z11, 1000-A12, 1000-B12, 1000-C12, 1000-D12, 1000-E12, 1000-F12, 1000-G12, 1000-H12, 1000-I12, 1000-J12, 1000-K12, 1000-L12, 1000-M12, 1000-N12, 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Famed for its combat superiority with the United Nations in the skies over Korea, the Sabre Jet is now being supplied to other NATO countries.

Twin Coach Aircraft Division was selected as a subcontractor for large and intricate machinery for the F-86 as well as for North American Aviation's other high-performance aircraft, the F-100 and F-104.

These important assignments are typical of the way in which leading aircraft manufacturers rely on Twin Coach as a source of major aircraft assemblies.

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EQUIPMENT



HYDRAULIC SERVACTUATORS (servo valve (left) shown attached to control actuator. Using multiple input servo valve (right) in production for fighter applications.



Each unit is a multiple input electro-hydraulic servo valve which receives electrical inputs from stabilizers and autopilot amplifiers, as well as the manual input from the pilot's control stick.

Servo Valve Reaction

The servo valve starts this way in the three distinct modes of operation:

- **Pilot's manual input:** position the servo spool, which in turn operates a hydraulic actuator to move the control surface. In performing this function, the servo valve acts as a conventional power control valve.

Autopilot control

is accomplished by introducing electrical signals from the autopilot which reduce errors to a minimum by the autopilot amplifier. This signal and the pilot's input and applies a pressure across the power control spool, which means the flow in the main surface actuator. Resulting surface movement provides the flight path control.

One of these units has been developed by Mag Valve Co., Inc., East Aurora, N.Y., and is in production for high-performance fighters.

Autopilot shutdown beyond the capability of the pilot at high speed flight is accomplished by reception of an electrical signal from the rate gyro for the particular axis, superimposed on the pilot's manual control input.

The resulting low-order output from the servo valve provides the necessary damping in addition to the normal flight control.

Both the Mag and the Hydruic

Two New Servo Valves Integrate Automatic Control, Pilot's Input

Los Angeles—New concept in integration of automatic flight control and stabilizers with pilot's manual input has been incorporated in two servo valves developed independently by high speed aircraft.

These units have been designed to provide:

- Improved control response.
- Decreased complexity in control actuation mechanisms, leading to increased reliability.
- Weight and space saving by elimination of separate control components and substitution of a single integrated package.

It is estimated that 20-40 lb. can



Soviet Air Division Goes Home

Soviet Yakovlev OBI-1000 trainers (foreground) and IL-28 bombers (second plane, with bomb bay open) are prepared for inland from Ossenbrück or base in East Germany. Fleets belonging to 21st Soviet Air Division, were sent home in part of Soviet demobilization campaign.

The ejection seat used by air forces of **26** nations.

MARTIN-BAKER AIRCRAFT COMPANY LIMITED

ENGLAND — CANADA

The illustration is of a Mark 44 fully motorized ejection seat as supplied to Aircrew Two Model of today.



Research note is the electrohydraulic amplifier (square valve) to convert the seat gyro electrical signal to hydraulic pressure.

Seat operational deflection factors in the Meng and Hydralite Research units also in the interest of separating (separating off) the seat gyro signal from the pilot (operator) signal.

In the Meng unit, separation is accomplished by adding, to the mechanism

of deployment of the power control rod, a tension spring, the movement generated by the control piston from the electro-hydraulic amplifier.

In the Hydralite Research unit, separation is accomplished by adding, to the seat mechanism, a valve which gives signal to the pilot (operator) signal.

Difference here between the two units is simply one of design approach.



THIS Grumman T-38A fighter pilot is demonstrating how to eject, open with flares out, and bail him out with the ejection seat.

Naval Center Develops Training Devices for Use by Services

Port Washington, N. Y.—The growing importance of training devices in the safety services is underscored by this recent statement made by a U. S. Navy fleet commander. "From now on I want a training device for every piece of equipment used in the service,"

To fulfill the commander's demand, the personnel division will be given responsibility for the U. S. Naval Training Device Center which recently celebrated its tenth anniversary at its headquarters here in the Brooklyn section of the George Washington estate.

Training devices are beginning to hold an equally important place in safety operations. Example: Link Corp.'s plan to deliver an electronic flight simulator for the Douglas DC-8 before the jet transport flies. This will mark the first time that a simulator has been available prior to the flight

of the aircraft which it was designed to simulate—showing the importance of having a training device at hand before placing a complicated new piece of hardware into operation.

The establishment which will fill a few months ago was called the Special Devices Center (Navy Sept. 16, 1953, p. 11) has the responsibility of developing, testing, procuring, and maintaining the equipment for the organization responsible for all Navy training. The devices are used to train men who work and fight in the air, on the sea, under the sea and on land.

Although article almost 100% of the devices developed serve the field of aviation, today approximately half of the center's funds go into surface and subsurface training equipment while an increasing portion of production funds are provided for nonaviation equipment. The center also does

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HIGH TEMPERATURE ACTUATOR



NOW hydraulic actuators
operating in areas of...
... 800° F

It is now possible for you to incorporate the advantages of hydraulics in high temperature areas as jet engines and afterburners. NWL designs developments in the seals and internal configuration of the new Lift Line High Temperature Actuators are making possible such units as the greatest temperature afterburner actuators.

STRAIGHTLINE ACTUATOR
A straight line actuator with a compact internal
piston and valve assembly. Internally balanced by this feature,
load conditions resulting from the use of this actuator
are reduced to a minimum. It is available in single and double
end configurations and is a family of Lift Line actuators.

ACTUATOR SPECIFICATIONS
Operating Pressure: 10 to 4,000 psi
Temperature Range: Ambient -40°F to
-60°F, -100°F, -140°F, -170°F, -200°F
-230°F, -260°F, -290°F, -320°F, -350°F
-380°F, -410°F and -440°F ambient
and in areas of 800° F.

ADDITIONAL SPECIFICATIONS
- and other areas as required.
- and other areas as required.

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designed hydraulically
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valve assembly of several sizes
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designed for
high temperature
operation.

turning research for the Army, and by
an Air Force liaison officer who maintains
turning device research and development
for the USAF.

Among the many active programs currently under way at the center are Research into nuclear powered aircraft (which Capt. C. H. S. Murphy, the center's commanding officer and director, termed a "very active investigation") and a digital computer being developed with the USAF and the University of Pennsylvania to replace analog computers.

The computer will bring great flexibility to aircraft design, it is claimed, by being able to "store" the characteristics of a specific aircraft. Today's seating configuration can only be calculated to simulate the characteristics of a single plane.

Another active program is the development of jet-engine starters (AW Mar 23, 1955, p. 38) which are about one-third the size of electronic starters and can start an aircraft from rest in such short a time as to permit an in-flight engine start in case of emergency. The center now has an M-111 jet-precooler turbine built by Canadian Corp.

Another other active program at the center is a helicopter flight actuator, developed by Bell Aircraft Corp., a certain sort of transducer, developed and built by All American Engineering, Inc., and a P-38J mobile flight trainer. The latter housed in two 40-ft road trailers in the rear complex, one of the last over-built, according to the Navy.

The center also had a hand in developing two Fleet Air Defense Training Centers, one in each coast, with which nuclear battles are fought. As Capt. Murphy said, "some day this theater can be developed which will select aircraft."

OFF THE LINE

Beth Arnoff Co., which had just received USAF contract for M-33 ground support units, has obtained a \$30,000 Navy order for a similar unit for starting jet aircraft, the Model 316 power unit.

The self-ignited generator powers by 100% by engine and auxiliary on one control bus, environment proof, heating and cooling inlets, it is planned for use for starting the F8U-1, AD-3N and F9F.

First composite-type aircraft in the equipped with turboshaft fans has cargo freighter Super Guppy is currently rolling off the production line at Wichita, Kan. The planes' main landing gear mount 11-1/2-12 inch hubless tires, which, wheel and bodies made by the

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tough, hard-to-twist places.
The unique, self-aligning
multi-wire 3-cables in this
newest model are held by stay-tight
grip-heads, a grip as much as
12-1/2 times stronger than
the old-style grip-heads.

3-CABLES IN 1 - pliers
engineers, electricians, mechanics,
automobile head, transmission
brake service. No adjustment
needed. Each head will write
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12" - per handle \$1.50
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per handle \$1.50
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Telephone: Memory-Kite
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RALPH C. ROBINSON CO.
Box 4549 W.H. St., Sacramento 15, Calif.

Canadian Distributors, Ontario, Ltd., Malton, Ont.

NATIONAL WATER LIFT COMPANY

DIVISION OF DULUTH PNEUMATIC TOOL COMPANY
2210 PALMIE AVE. MUSKEGO, WISCONSIN

Lift *Line*



Business flies his way!

E. Marvitt (Andy) Anderson, Shell Aviation Dealer at General Mitchell Field, Milwaukee, has a knock for making friends and making money. Maybe that's because he keeps so busy.

Meet Andy Anderson—aircraft salesman, Andy first tried his hand at selling airplanes as a distributor for a popular airplane manufacturer and has consistently been on the "Top Ten" list of leading salesmen for this make.

Meet Andy Anderson—instructor in flying. When you love flying as much as Andy, it's only natural for you to pass on your enthusiasm. So Andy established a glider school and a student training center in Wisconsin plus a

primary flying school in Missouri to help hundreds of young pilots.

Meet Andy Anderson—flying ambassador. Andy goes everywhere in his own plane . . . signing up new clients . . . looking after all the Anderson interests.

Meet Andy Anderson—Shell Aviation Dealer. Andy's first big success was with Shell. His company, Anderson Air Activities at General Mitchell Field, Milwaukee, was formed in 1941. Today it's a round-the-clock operation, servicing four major airlines, an Air Force reserve unit, a National Guard squadron and a host of private and corporate planes.

And more and more business keeps flying

Andy's way. It's no wonder! He has a sure-fire sales-building approach—"Give 'em what they want . . . on-schedule service."

With a full line of Shell Aviation products in the shop, the very latest Shell equipment on the runways and the Shell Aviation Credit Card system to save the flier even more time, AAA is equipped to service anything that flies . . . quickly, efficiently.

For example, the daily routine includes preparing a giant airliner for a "cross-country hop" . . . getting a corporate flier off on schedule for an appointment in Cleveland . . . refueling Air Force jets for patrol duty . . . checking and servicing a private plane before it takes off on a weekend jaunt.

AAA has to keep up with the latest service methods, too. It depends upon frequent visits from the Shell aviation specialist plus merchandise hints in the Shell Dealer magazine to keep abreast of what's new in runway service.

Since he became a Shell Aviation Dealer, Andy has boosted his gallonage almost three thousand per cent. No doubt about it—Andy Anderson sells for Shell and does a fine job. But Andy, himself, has said, "Shell sells for me!" And he can prove it.



With the latest Shell equipment on the runway, AAA gives them Air Force jets quick, efficient service.



Private fliers like the way AAA rolls out the red carpet as soon as they roll in.



AAA (Anderson Air Activities) helps major airlines meet split-second schedules with efficient, on-schedule service.



Dependable Shell aviation products in the shop help AAA do a fast job on planes.

It pays to be a Shell Aviation Dealer
—and the Shell office nearest you will be glad to show you why





Rascal "no time over the target"

High in the stratosphere, a huge U.S. Air Force bomber wheels. At its nose, a long, sleek missile roars by from the bunker. Rocket engine firing, the stage accelerates to high speed and reaches out the distance as air-to-surface missiles on its swift way to a far-off target.

This, as brief, is the mission of the GAM-87 Rascal guided missile—designed, developed and produced for the U.S. Air Force by Bell Aircraft Corporation.

Rascal is a long range, air-to-surface missile which accomplishes its mission without exposing the bomber aircraft to concentrated local defense. Rascal can be launched and poised to its destination while the bomber is on its homeward flight, thus sparing aircraft and crewmen the critical "time over the target."

The guidance system which controls Rascal is close to human intelligence and operates just as if a pilot were riding in the nose of this missile. Rascal is propelled at its tremendous speeds by a rocket engine also developed by Bell.

Rascal encompasses use of the broad concepts of Air Force missile programming and Bell Aircraft has applied all the skills of its vast scientific and engineering teams in the development of this strategic weapon system.

The Air Force-industry team urgently needs scientists and engineers for projects vital in the military defense. Opportunities to make important contributions are offered in military aircraft programs.



ENGINEERING BULLETIN

ON MICRO BEARINGS

Micro Instrument Ball Bearings

Subjects: FACTORS TO CONSIDER IN MINIATURE BEARING APPLICATION

TYPES OF BEARINGS

The Rasmus Bearing offers well with the one shown below it is well suited for the great majority of instrument applications. Even ball bearing manufacturers have found it to be a very popular bearing at low speeds, and it can also handle radial or thrust loads imposed by rotating techniques found in crown reductions and applications for low-torque requirements.

Plastic Bearings machined from phenolic plastic allow higher speeds and a much longer life than metal ball bearings. This bearing is well suited for angular contact bearings where one end is ground away from the main bearing surface to allow for a bearing to be a design feature that only in the direction of the side bearing. Full ball bearings are a full complement of balls. Filling notches are ground on one side of the bearing to reduce weight and increase strength. This type is usually being replaced by a related dimension of the ball bearing but less weight to facilitate and simplify in its advantage for certain applications requiring high speeds and low load capacities. It is made to handle great loads because of parallel inner and outer rings and the lack of side bearing. Contact between the balls creates friction which makes the full ball bearing unsuitable for new torque at high speed applications.

ROTATIONAL DIRECTION

Because steel's anti-corrosive properties are excellent, steel ball bearings are designed in precision instruments, and it has become one of the standard materials for this purpose. It can be ground to a finish to a high degree of precision.

Steel should only be specified when bearings must operate at extremely high speeds, or when no other effect is required in a application. It has a conventional loaded load rating when these values are not subject to rapid wear or if not protected from damage and galling.

Aluminum Cages should be preferred to applications which require very good anti-corrosive properties of the bearing. All components of the bearing are fully machined down this material. If non-corrosive properties are not required, aluminum is about a better alternative.

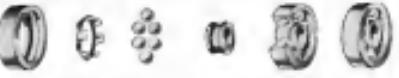
LOAD RATINGS

A precision bearing is seldom operated at or near its rated load capacity. However, the designer must have sufficient information to ensure intelligent application of the bearing. This is available in the New Hampshire Ball Bearings, Inc. catalog tables are based on standard established by the AFMRA after extensive testing.

Dynamic load ratings apply to bearings that are rotating. Thermosensitive



NEW HAMPSHIRE BALL BEARINGS, INC.
PETERBOROUGH 3, NEW HAMPSHIRE



Rasmus Bearing — Exploded and Assembled Views



Rasmus Bearing — Flanged and Shielded

ing calculations can be avoided by using one of the C factor charts in our catalog.

Static load ratings apply to bearings at rest. Since this exists on only a few occasions, static load rating is not often given in catalog tables. Formulas have been developed, however, and the need for this information is decreasing, — primarily for static ratings to check bearing

ROTATIONAL DIRECTION

Radial play is the displacement of one ring with respect to the other along the axial direction.

It is important in the successful application of precision bearings and instruments to understand the nature of these factors in determining the most appropriate but higher or lower load capacities may be required.

Radial clearance may be required. For example, if a bearing is to be used in a system that has a fixed distance from zero to zero, it should be a level .0007". Axial play in the direction of the load may be required.

Radial play — Minimum distance from zero to zero. This is the distance between the outer ring and the inner ring when the outer ring is held in the zero position.

Axial play — The maximum axial displacement of the outer ring from its zero position when both rings are held in the zero position.

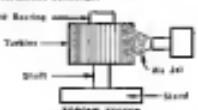
In the other ring, the bearing acts as a lockup only when the outer ring is held in the zero position. Radial and axial play are naturally dependent factors and the former is the one usually specified.

TORQUE TESTS

Precise instruments require bearings with minimum inherent friction. This is usually obtained by using bearings often used to drive loads. This is the reason necessary to induce rotation from a standstill under slowly established conditions of mounting and loading.

Torque tests can reveal much about

the true quality and geometry of the bearing. Investigations bring into light the true nature of the bearing's characteristics as to the influence of instrumentation.



INSPECTING PRACTICE

An inspection of the shaft or bearing assembly will reveal the quality of a precision bearing. The bearing very often with such inspection that bearing manufacturers are reluctant to make detailed recommendations about inspection techniques for their bearings. The user cannot be sure that he has selected proper fits unless he has confidence in the variables involved in the manufacture of both bearings and bearings.

For selective assembly, "fitted bearings" can be supplied. These bearings are made to a standard size and are held in a bearing housing by a "HOLD" interference. It is possible to assemble these bearings within the specified limits within the same assembly. The user need not question if an assembly is correct, since the bearing can be specified only by what it offers in advantages justify the additional cost.

DESIGNERS HANDBOOK FREE TO ENGINEERS

If you work with miniature bearings, you will find the new 70-page authoritative handbook a great help in solving problems in the design, manufacture, and application of miniature bearings.

Free to engineers, draftsmen and purchasing agents.

Write New Hampshire Ball Bearings Inc., Peterborough 1, N.H.





RESEARCH WELDING for fabrication beyond the standard concept

For decades, we've provided research company and atomic structures and for other technical projects. Research Welding is equipped to process experimental work requiring high-strength circumferential-weldments.

Our facilities include a 10-ton capacity horizontal forge, a 10-ton vertical forge, a 10-ton horizontal forge and the latest automated welding equipment. Mass Spectrometer and hydro testing, US-APL approved quality control procedures.

Research Welding has developed components for General Dynamics, Douglas, Lockheed, GE, Hughes, Bell, Hastings, USAF.

Let us consider your problem. Get in touch today for information. We're sure you'll find our new under construction web reveals our growing facilities and the complete development of our second decade.



RESEARCH
WELDING & ENGINEERING CO., INC.
1000 SANTA FE AVE. • 200TH FLOOR, DOWNTOWN

NEW AVIATION PRODUCTS



Flowmeter Gas Ultrasonics

Ultrasonic range is utilized to determine volume or mass of fluid passing through a smooth bore sensor. Ultrasonic reading of mass flow rate, mass rate/density, volumetric flow rate, volumetric, infiltration and fluid density can be obtained. The device will handle up to 720,000 lb hr at 90,000 gpm at jet fuel with an accuracy of 1%.

The sensor for a four-inch line is 10 in. long and weighs 10 lb.

Measure Instruments Division, The W. E. Marres Corp., 6737 Astoria IV, Long Island City 1, N. Y.

Drive Test Stand

Constant speed drive test stand uses electronically controlled variable speed motor to simulate variations of engine speed in flight and maximum air density of constant speed drive from the established value. Test in the operating range from 180 to 5800 rpm. Optional accessories are variable blower

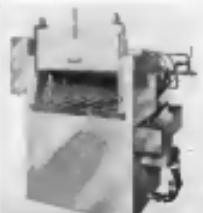


for generator and alternator, load bank for alternator and generator, impingement to test drive stability and a choice to mount specimen drive unit weighing up to 500 lb.

Gard Holloman, Inc., New York International Airport, Jamaica 32, N. Y.

Automatic Cleaner

Small parts are cleaned, rinsed and dried in an automatic machine which can process 46 batches per hour. Automatic adjustable cleaning sequence



uses hot pressurized cleaning solution spray, hot water rinse spray and dry spray. Hot air dryer can be added if required but lateral heat of parts is expected to make drying drying adequate. Chips and foreign material are removed from working solution by slag basket. Solution tank forces the heat of the

AVIATION WEEK, September 10, 1956

CURTIS-WRIGHT

POWER

SAFETY - RESEARCH - RADIOS - WEAPONS - RESEARCH - AVIATION

**...and the U.S. Navy's
Offshore Patrol
that guards America**

While you work, while you play, while you sleep—through any threat to your way of life is the fastest thing from your mind, the U. S. Navy is in action in the air along America's shores, protecting the peace you enjoy. This patriotic photo of Naval Aviation in the job of the Navy's "Offshore Patrol" ... and Curtiss-Wright power is everywhere in the picture.

Curtiss-Wright Turbo Compound® powered Lockheed Super Constellation WV early warning radar planes, and Lockheed Neptune P2V and Martin Marlin PBM long-range reconnaissance planes cruise far out to sea—day and night, over watchful Cyclone 9-powered Grumman Tracker S-2F sub hunters and Sikorsky HSS helicopters soar closer in, providing a tight defense ring against invasion. Cyclone 7a power Vertia HUFP helicopters, and Gencor CGP blimps with Curtiss Electric Propellers. The resultant "protection perimeter" extends from the Arctic Ocean southward to the entire continent.

These Curtiss-Wright aircraft engines—plus Curtiss-Wright jet and rocket power—are ready & expertly designed. The peace, meanwhile, they help you to work and play in moderation, sleep soundly.

YOUNG MEN! BECOME A NAVAL AVIATOR



Apply at any Naval Air
or Recruiting Station



WRIGHT AERONAUTICAL DIVISION
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World Power Through Engines



Which one will qualify as a missile engineer?

All...or none...depending on their important passes! The desire for a real engineering challenge. The ability to work with a top team of experts in their respective fields. The courage to take on unusual responsibility.

If this sounds like a job, it's because North American Aviation has a lot to offer. With research, development and manufacturing responsibility for the U.S. Air Force SM-64 Navaho Intercontinental Missile, the scope of the art at North American is wide and the opportunity to assume a position of authority great. In fact, all phases of this program—research, design, development and manufacturing—are being accomplished by North American engineers.

And what benefits will you find in this type of engineering environment?

First of all—recognition that comes from the opportunity for individual effort. You will work with engineers who respect your opinions and professional status. Because missile engineering covers so many fields, you can work in the area of your choice. You will work on a team of specialists whose leadership in these fields will further you in the area you choose. You will live in Southern California and receive financial compensation seconded only by your own ability.

If you have the desire for a real engineering challenge—contact us now.

Contact: Mr. M. Bressert, Missile Engineering Personnel
Dept. 56-9 AW, 12214 Lakewood Boulevard, Downey, Calif.

NORTH AMERICAN AVIATION, INC.

colored and contour plate coils for heating of cleaning solution.

Russell Inc., 3801 Ford Blvd., Hamilton, Ohio.

Hydraulic Valve for 1,500 Psi

Hydraulic valve for aviation use weighs about one-half pound and is designed for 1,500 psi working pressure. It features a sealed rubber valve seat permitting hydrostatic pressure of the valve to be pumped up while the valve is closed.

Application of the Model 4500 is valve parking valve and bypass valve for brake systems in addition to pressure pressure controls. Unit weighs 1.5 lb. O. 986.

Scott Aviation Corp., Lancaster, N. Y.

ALSO ON THE MARKET

Model 346 Linear Amplifier meets all requirements for amplifying, adjustment for low and high level pulses, high distortion from 100 megacycle, detection, modulation, amplitude and other pulse detection. Measurements may be made in μ sec. C_0^2 X-Bar peak in the presence of a 4,000,000 gauss C_0^2 (11.13 mcs) background—Franklin Electronics, Inc., East Fourth St., Bridgeport, Pa.

Heat reflective laminate, by combining principles of reflectivity of radiant energy with insulation characteristics of glass fiber reinforced plastic, affords a barrier to heat transfer at temperatures up to 1,200°. Additional advantages are weight savings and adaptability to unusual designs. Whittaker Photon Co., 6988 Franklin Blvd., Los Angeles, Calif.

Induction motor, a linear velocity in seventh controllable in the range of microvolts. Exploiting induction by effect, structure of the motor shows radio influence of an electromagnetic field, snapping back to original position when magnetic field is de-energized. —Aerobics Instruments Laboratory, Inc., 161 Old Country Rd., Mineola, N. Y.

Packed Nylon winding mount, a nylon pellet impregnated or threaded, for use in transistors, a new and improved form of SPS standard, speed and aircraft socket cores products. Insert eliminates need for after winding drives. Standard Poured Steel Co., Jeannette, Pa.

Grade G10-665, glass-lease sheet laminate bonded with an epoxy resin, has low water absorption, low dielectric factor, and high bond strength, it meets MIL-P-81377. Material is available in sheet sizes of 39x87 in with thickness

from .001 to .1 in. and can be supplied in a standard laminate or with copper foil on one or both sides for printed circuit boards.—National Varnished Fiber Co., 1856 Birch St., Wilmette, Ill.

Electrical semi-automatic optical assembly combines the versatile processes of opto-circuit, as well as solder, tape-wrapping (125 in. x 145 mil) and electo-soldering, resulting in a reliable and moisture-tight seal. Unit is designed for use with all types of cords to which the opto-circuit is connected, general U. S. Military specification.—Flemont Division of Devcon Folder Co., 18 South First St., Fredonia, N. Y.

Model LAV-9 16-ton, 7 in. diameter precision potentiometer has all metal external construction, metal-to-metal stops, stainless steel ball bearing, and glass sealed terminals. Letter Index Unit Components Division, 5511 Radio Rd., Los Angeles 16, Calif.

Model DV-4, power supply and de-modulator unit, has been developed for use with aircraft in flight test applications where 15.5°, 400 cycle magne pulse power is available. Unit is 6 in. x wide x 7.5 in. high x 12.5 in. long, it weighs 11.36 lb.—Deacon's Division of Minneapolis-Honeywell, 1400 Selden Field Rd., Boston, Mass.



Turboprop transports with set records on



THE LOCKHEED YC-121B, powered by four Pratt & Whitney T-34 turboprop engines, is the world's fastest propeller-driven transport. The aircraft cruises at 420 mph.



A PRATT & WHITNEY AIRCRAFT T-34 turboprop engine is loaded aboard a YC-97 Boeing Transport.

MATS COMMANDER Lt. General Joseph Smith rates the engine's record: "My Command appreciates greatly that these record flights require considerably less maintenance than that required for any of our larger transport engines in common use. This remarkable record foretells that the services we can expect from the Pratt & Whitney T-34 engines which will come into MATS operation." Pratt & Whitney Aircraft is most gratified for the magnificent accomplishments of MATS which are contributing very substantially to the success of the T-34.



T-34 engines MATS World Routes

6000-horsepower T-34s show their stamina in Boeing and Lockheed transports

The Military Air Transport Service is already using Pratt & Whitney Aircraft T-34 engines in Boeing YC-97s and Lockheed YC-121Fs on its world routes. This engine also powers the Douglas C-124A, the highest payload production transport ever to go into service.

The outstanding service performance of the T-34 engine is another example of Pratt & Whitney Aircraft's continuing leadership in design, development and production of dependable engines.

New records include—

- A Lockheed YC-121F flight from over Gander, Newfoundland, to Shannon, Ireland, in 4 hours and 13 minutes.
- Boeing YC-97 round trips from Texas to Germany and Japan, the first turboprop transport flights across both Atlantic and Pacific.
- A new in-service MATS record, set when two YC-97s flew a total of 96 hours and 35 minutes during a single 24-hour period.



EACH BOEING YC-97 has accumulated over 2000 flight hours and their engines are already operating over 500 hours between overhauls. These aircraft have maintained 8.3 hours daily utilization during a single month, demonstrating the reliability of the airframe, propeller, engine combination.

PRATT & WHITNEY AIRCRAFT

Division of United Aircraft Corporations • Main Office and Plant: East Hartford, Connecticut
Branch Plants: North Haven—Southington—Meriden

National Aircraft Show Displays



AEROFUTRICS hypersonic test vehicle.



F-8H fighter jet on display at the show.



TEMCO Model S1 primary trainer aircraft on display at the show.



PILOTS demonstrate features of Cessna 310T cockpit.



JET INTAKE shows intake flaps with foliage when gas is up. Intake warmer on top operates automatically to prevent buffering.



WHEN T-37 thrust attenuator (above) opens - - -

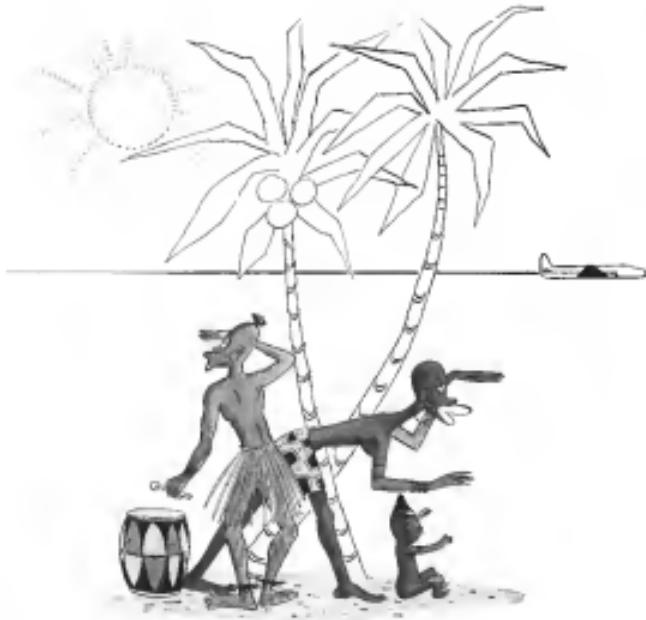


IT DIVERTS jet blast sideways. At 40-60% of thrust, Control surfaces move with open plates below 70% of power.



FORWARDED position of Continental T-60 CTA engine (top right) eliminates speed reduction, eliminates options in Cessna 310T. Radar has single pylon mount (bottom).





Around the equator 1,500,000 times!

Passenger on the scheduled air fleets of the world last year logged 55 billion miles—enough for one passenger to fly around the equator a million and a half times! This figure represents a gain of 18% over total passenger miles flown in 1954. And this amazing record is expected to be broken again in 1956.

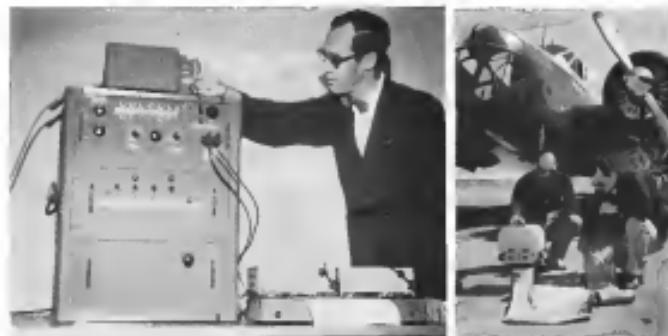
As more and more people fly more and more miles, new and better planes are being developed

to serve them. To keep these planes flying, operators know they can rely on Esso Marketers for the finest in modern aviation fuels and lubricants—perfected through years of research—and for the finest in uniform, safe and efficient petroleum services along the airways of the world.



6 OUT OF 10 OF ALL THE WORLD'S INTERNATIONAL AIRLINES USE

BUSINESS FLYING



HYCON COMPUTER (left) is used to process geophysical data rapidly and present detailed seismographic maps without long delays. A plane in one hour often records enough data to keep the Hycon office busy for about 100 hr. Photo on right: At El Al, World War II Air Force bombardier and navigator, Isidor Kerner, prepares for photo missions with Hycon-developed cameras and map study. Hycon is pioneering development of aerial color photography with its own temperature control, developing methods.

Aerial Surveys Grow on Speed, Savings

By Bernd Lang

PROGRESS, Calif.—Mining, oil, leather and other firms are getting speedier and accurate mapping and exploration services from aerial surveys, a service worth in itself to totals of \$30 million a year. One of the top firms is Hycon Aerial Survey, Inc., partly owned by two men whose

experience at test, Varian Associates of Palo Alto, Calif., provide much of the electronic devices and Hycon Mfg. Co. through its cameras and cameras, record data, process results of photo exposures, and make maps.

Although headquartered in Pasadena, Hycon Aerial also maintains laboratories and offices in Washington, D. C., Dayton, Ohio, and Phoenix,

Beth, and sales offices in Seattle, Chicago, Los Angeles, and Quebec, Canada.

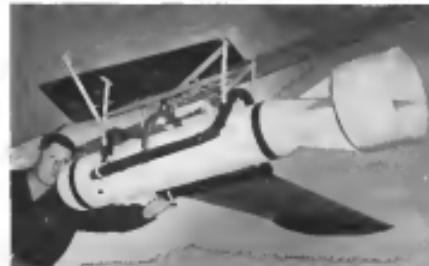
Progress company, both in time and money, is the best reason for aerial surveys' popularity. Photo prints out that are used instantaneously, too, and one half hour and \$86,000 were saved in a project to determine whether a coal would go around or through a narrow bay.

If solved by ground crews, such a task would take approximately three years and cost about \$100,000, but as it required no surveys and only \$19,912.

Techniques Offered

Services and techniques offered by the company include photographic engineering, photographic and graphical aerial survey, photo geologic evaluation, and photometric erosion, and topographic.

Designed for aerial surveys is a world-wide and Hycon is equipped to handle both domestic and foreign expeditions in such fields as geologic, forestry, and conservational, petroleum, mining, high seas, airfield traffic, utilities, port lines, transmission lines, bridges, harbors, flood control, city planning, legal evidence, water resources and wild life surveys. Soon to be introduced



IRD USED to detect oil deposits. Radar contains two sensitive coils each tuned to one of the transposed frequencies, making it possible to look a 400 ft. south beneath the plane.

LIQUID ENGINE DIVISION



In polar areas, deserts, and atmospheric research vehicles, Aerojet General liquid propellant rockets have power associated by creating liquid superperformance and air power plants.



With your interests in Vanguard in view, Aerojet General offers a variety of challenging assignments for:

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Electrical Engineers

Chemical Engineers

Electronics Engineers

Aerospace Engineers

Civil Engineers

Metallurgists

Chemists

Physicists

Mathematicians

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The General Dynamics Defense & Electronics Group

White, Parsons, Johnson & Company
Engineering Personnel, Inc., 2548
Avenue, East of East 190th Street
Bronx, New York



FLY WHICH SURVEYS is Blyton flying geophysical laboratory showing horizontal loop search instruments on electromagnetic field. Blyton's operator (left, below) is detector or "bird" which picks up signal indicating presence of ore deposits. Photo also shows Blyton's sprung carriage to reward flight paths.

aerial surveys by helicopter, furthering Blyton's already wide potential.

Used now as a test program using a Bell 47G-2 equipped with a magnetometer, the electromagnetic search locator acquisition is starting down to contract work early this fall.

Geophysical exploration can be done in less time and with more speed than from ground surveys, says Blyton's Geophysicist Ken Blyton. Some of the largest mines are located on test plots of land of only 200 acres in the rougher terrain, the company's heli-copter system will enable detailed surveys to be made over areas too small to be economically feasible by finding explosives.

Aircraft Requirements

Aerial requirements vary with the diversified fields of survey. World War II surplus planes, complemented with current German and British models, are in use.

They are selected for their aeronautical qualities. A T-6, for instance, is not able for certain types of mapping of high terrain, requiring altitudes up to 30,000 ft. At present, Blyton's fleet consists of the following: one B-17, one B-57, one AT-11, one B-47, one B-57, one PBY and five P-51.

With an eye to the future Blyton is:

- Introducing helicopter aerial surveys carrying three detection devices in a single flight.
- Developing aerial color photographs techniques for spotting mineral deposits and for forest evaluation.
- Using a light-weight stage carriage

geophysical camera which presents photographic film from a small, single engine plane. This, for the first time, makes aerial color photographs that are not blurred.

These electronic devices which have contributed so much to aerial surveys are the magnetometer, electromagnetic locator and seismometer.

Magnetometer measures out large mineral deposits by reading the deviations this produces in the earth's magnetic field. It has been used to locate areas of iron, copper, lead and zinc. It aids geologists find structures which can control oil.

The helicopter carries the magnetometer which is electrical conductors. It is sensitive enough to detect minute ore bodies that contain copper, lead and nickel. The device sets up a high magnetic field to bring an electric current through a wire and bulb around the plane, thus measure the distortion induced in the field by electrical conductors in the earth.

During a test, electromagnetometer carries two sensors each fastened to one of the unmounted front engine nacelles. It is possible to test a 100-mile radius. The magnetic search helicopter carries will consist both in-phase and out-of-phase components of the field at a frequency of 4,000 cycles. The helicopter unit has completed 2,000 feet out of 100 flying over known ore bodies in Canada with excellent results according to Blyton. Developed in Aeromagnetic Services.



s'Graesande's Stoomwagen

s'Graesande's Steam Reaction Car

In 1726 Jacob Willem s'Graesande of Delft, stimulated by the recently enunciated Third Law of Motion, astounded the Royal Society by constructing a practical steam reaction car.

The vehicle actually moved several times its own length, a distance of about two insters.

In 1958 the goal is no longer meters, but hundreds, and even thousands, of miles. Aerojet-General Corporation, leader in American rocket propulsion for more than a decade, is proud to participate in even's first assault on the frontiers of outer space—Project Vanguard.

Aerojet General

A Division of
GENERAL DYNAMICS
The General Dynamics Defense & Electronics Group

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Aerospace
Facilities, California

Aerojet-General invites scientists and engineers—men of imagination and vision—to join the attack on the most significant research, development and production problems of our time.

WEATHERHEAD MS^{ER} FLARELESS TUBE FITTINGS connect the arteries of America's wings!

When it comes to aircraft tube connections, a plane to spendly Weatherhead MS flareless tube fittings. The standard for new aircraft and intake design, America's Number One source, Weatherhead does gives you the benefit of many years in processing, developing, and testing these fittings to meet the highest standards of the U.S. Air Force and U.S. Navy. And only Weatherhead manufactures the tools and machines for pre-tinning MS sleeves—key to speedy production assembly with the positive high pressure sealing advantages now in reversed demand.

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possible aids throughout
every stage of design, in-
stallation, operation:

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- Engineering design assistance
- Instructional field service
- Complete research and laboratory facilities (vacuum, metallurgical and chemical)

Weatherhead MS Flareless
Tubes are recommended
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THE WEATHERHEAD COMPANY
Aviation Division

300 EAST 12TH STREET CLEVELAND, OHIO
Main Office: 1000 Euclid Avenue, Cleveland, Ohio
Phone: CLEVELAND 4-8700 446-1211 446-1212 446-1213 446-1214



Argentine Home-Built Lightplane

Ministro E. which is a copy of the French Pieljet monoplane, was built at home in 1959 by an Argentine friend, Arnold Bedding, and his wife. The two passenger seaplane is powered by a 65 hp Continental engine. Bedding, who is an Northern graduate of Marquette High, the nephews would find engine most logical source of fuel in muscle iron, turned to hand building because of high cost of private plane in Argentina.

End of Toronto, Canada, the bird is made of doped cloth and fibreglass. The wife of the U.S. license.

Argentine's other aviators make do with less. In the middle of the world, radiation counter is the only other variable data collector. Precise information on total field gamma radiation information on the spectrum of the radiation provides identification of the terrain at all times, and a positive record of the location of the aircraft above terrain. All records are correlated with photographs taken in a 35-mm camera as the overall film on flight lines determined on a previously prepared photograph. A microballoons recording radio device also provides continuous record of flight altitude. With these records, potential oil traps areas can be easily defined on a photograph, can be made.

Color Photography

It is pioneering the development of color photography and to date, has over 100,000 sq. in. of successful results. With careful temperature control, partly of developing solutions and other developments in camera methods, this new step in natural resources evaluation gives oil companies and oilmen better view of subtle variations in the rock color. Many companies find spotting the wind-blown and green colors of copper deposits and the visual colors of the various variable mineral

of the various faults very useful.

"Fisher moving" with the aerial camera is another 11-con service. It has a 35-mm camera, which is used to record soft rock growth. When color photography is coupled with video plotting, strip mapping technique, controlled geologic maps can be turned out without a geological survey from the ground.

Oil, Mining

This armament for a large portion of the aerial survey business because oil and mining companies are willing to spend money to get a preliminary evaluation study before spending staggering sums for aerial survey, ground geophysics and drilling programs. The aerial evaluation, in conjunction with the "fisher moving" technique, adapts the "fish eye" to a bird's eye look, with modern graphics, oil and photographic techniques being employed on a photograph.

Another use of these services is in flying geological laboratories. A PBY airplane carrying well over a ton of high sensitive electronic instruments which can simultaneously measure surveys of various areas in a matter of months. The flying laboratory can cover 100 sq. mi. a day, an area that would take a van to cover on the ground. Using the older prospecting methods, U.S. oil and mining companies as well as private and federal



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This rate of climb comes as no surprise. Skyray also holds the world's official FAI sea level speed records for the 3- and 100-kilometer courses.

Agreement of foreign governments is off- ficed the plane at a cost of about \$100,000 apiece.



Bell Ranger Makes Sales Tour in South America

At least 17 major sales demonstrations at 25 Central and South American countries are planned for new four-blade Bell 47G Ranger stable helicopters. Piloted by Joe Malinowski, assistant director of marketing, the Ranger left Bell's Ft. Worth, Tex., Helicopter Division at maximum gross weight of 2,955 lb., including maximum lift, to quickly adapt the aircraft for specialized mining and other fuel tasks. Calcas has a pitch increase, pointing up its maximum transport role. The Ranger demonstration is expected to return to the factory in November.

Agreements of foreign governments are off- ficed the plane at a cost of about \$100,000 apiece.

Highly successful sales brochure of over \$1,155,000 includes projects for the U.S. Army Map Service, Republic of Chile, California State Division of Highways and major oil and mining companies in South America, the Caribbean and Alaska.

Germans Will Open Private Air School

Braun-Fluit and only private aviation school in Germany will open in Frankfurt, Oct. 1, under the name Luftfahrtakademie An der Fliegerakademie über der Zürche Luftfahrt. The school will have personnel for all branches of civil aviation.

As a result of the drawings of several aviation personnel, the civil aviation have granted full assistance to the school. Training personnel will consist exclusively of former and present civil aviation agents. Airlines will also available personnel and facilities for the planned part of the training.

Miami Firm Converts Three Cessna T50s

Miami Air Corporation at Miami has completed the conversion of three Cessna 179 aircraft for a Chinook cargo.

Scaling capacity of the three cargo planes was boosted from five to six and a cargo seat added. Removal of the rear passenger seats makes

Piper Sales Jump

Business and stable plane sales are up 120% over a year ago. Piper Aircraft Corp., Lock Haven, Pa., reports. Company with two years ago the increase is 140%. Increase in fiscal 1956 (Oct. 1, 1955 through August 1956) is another, Super Cub PA-18 and PA-18A, 121%; Tri-Pacer PA-22, 124%; and Apache PA-25, 139%.

possible the quiet conversion of the Cubas to freight carriers.

Replacement of the results 225 hp Jacobs engine with 300 hp Lycoming has improved their short field capabilities, according to the Corporation. The firm has positioned previous and current versions of the same engine for various needs.

PRIVATE LINES

Notched tail fin lightplane at the same cost as a two-cold, open cockpit jet being offered by Firestone Tire & Rubber Co., Akron, Ohio. The new fins replace the firm's three cold tail. Total available wings are 100 x 5.5 ft. straight wings and eight 60 x 11.00 x 12.72, eight additional wings 6.00 ft. placed on the market soon.

Asks for authorizing construction of agricultural station in 1956 was presented to C. J. (Jack) Rose, Comptroller, Morris Corp., president of National Association of Flying Farmers at their national convention.

Sikorsky S-38B, recently delivered to Okanagan Helicopters, Ltd., will repellect the firm's fleet 300 ft. in range, giving operations to northern Canada.

Two Convair 580s have been equipped with the new Federal auto pilot by Pacific Aviation Corp. to demonstrate the approach to fixed base operators and aircraft dealers as a 15-state area in the West and Middle West. The selection completed with the 580, the single-engine version and about \$2,500 for the two-engine model (AVN Apr. 25 p. 16).

Helicopters will be a Detroit Match, real estate organization to give prospective home-owners an aerial view of its new housing development.



ROTABLE LIGHT can be used for landing and taxicoming, having a 360-degree rotation in either direction and sheet shading extender on its 250 ft. wire. Rotatable beam is made of aluminum like a spot light. Lamp is 450 watts. Maker of light, Gandy Manufacturing Co., Utica, Ohio, uses the G-250-1 light on its Rock 1000 and Cessna 110 business planes.

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SAFETY

Set on the date of the accident from 7:58 hr to 8:15. Prior to 1932 it flew 1,012 hr with the Royal Air Force, purchased in that year by British Airtours (Prestwich) Ltd. at 100 completely overhauled and reconstructed and since had flown 5,887 hours.

The nearest Certificate of Airworthiness was issued on June 20, 1935 valid until June 18, 1938. On the return of the crew of the accident, the Royal Airtours engineer in charge of aircraft maintenance and repair stated it was understood which had been brought up to the specification of a new set.

Without attempting to detract the very commendable body of evidence, put before me, I can only say that it is my opinion that this accident was due to our ordinary carelessness or lack of the way in which this aircraft was constructed or maintained. I am satisfied that it was properly and effectively maintained and repaired to our standards.

If but have properly loaded and balanced, the load had been carefully tested and noted carried out after the accident was due to prior than an engine failure or failure of controls or controls. The tires were in good condition and the aircraft was not put upon them, otherwise than pressure.

The pilot stated his load had been reflected in a pressure of 60 lb per square inch, but stated a pressure of 15 lb or more was correct. He also stated that he had been flying with a pilot who had told him Mr. Gossage, the aircraft's chief pilot and a back flying in the extremities, stated "marked". It is my

opinion to deal directly with the failure of the maintenance.

"An accident is not of course built in itself, it admits no more than a modicum of fault. The majority of the maintenance was performed at the inspection of the aircraft made at Farnborough after the accident show that the stresses imposed on the maintenance, which it is my view, were excessive, which it was already undergoing and in an extent which no maintenance is designed to support.

The Committee discussed an age of fatigue but the evidence was not enough to allow them to conclude the aircraft was fatigued.

The evidence shows conclusively that the accident is not to be attributed to the aircraft.

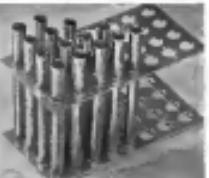
HANDLING OF THE AIRCRAFT

Capt. Wilson, who was piloting "Duchess" when it crashed, is an experienced pilot. He has been continuously engaged being involved in an accident since March, 1941 and on April 20 had three of 16,077 hr, of which 1,770 hr were in York. Capt. Wilson is a member of the York Aero Club and has an uneventful record as a commercial pilot. He is described as a courageous pilot and a most experienced pilot who could be relied upon under all circumstances.

Another witness of similar qualifications said that his ability can well up to what



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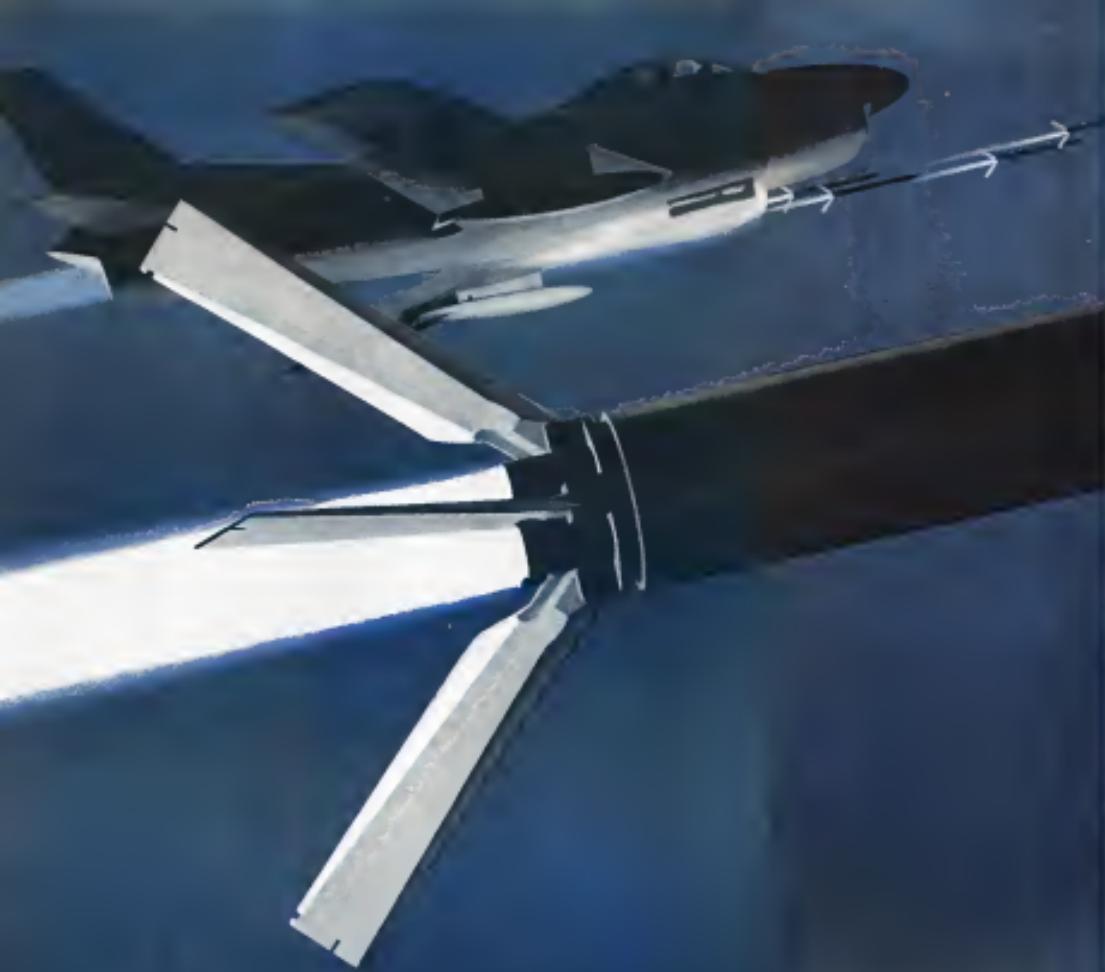
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SAFETY

so the officers on the radar will grid safely underneath.

Capt. Wilson's evidence was that he landed on Uncle Louie on the threshold of the runway straddling the white line but positioned 5 deg. to the left of it. He had stopped the aircraft at 100 ft. above ground level, that he had not been very straight. This evidence is corroborated and I am satisfied that the aircraft was properly landed up. It is not easy to line up a York exactly and although an easy task of its mechanics to travel to the left, it is better to travel any distance as far to the right as to the left. I am satisfied that 5 deg. is well within the limits of tolerance. After carrying out the usual pre-take off checks he received permission to proceed and "Uncle Louie" moved his wheels.

What happened thereafter is described by Capt. Wilson and his description is typical to the latter part of the aircraft's course can be checked with the mark left by the wheels and subsequently plotted on a map. Capt. Wilson's account was as follows:

It [the aircraft] is "Uncle Louie," moved slightly to the left. I corrected the take-off run. The aircraft moved to center straight. Then I felt a violent jolt to the right. I closed my eyes. It [the jolt] pulled everything forward. The front wheel left the ground and I closed my eyes. The aircraft was in a roll. I could feel it. After I had got my hands off the stick I was preparing to use one of the sticks to pull the aircraft up. The aircraft seemed to roll on. The next thing we were off in 180 deg. turn. Then of course we sat down.

Closed Titles

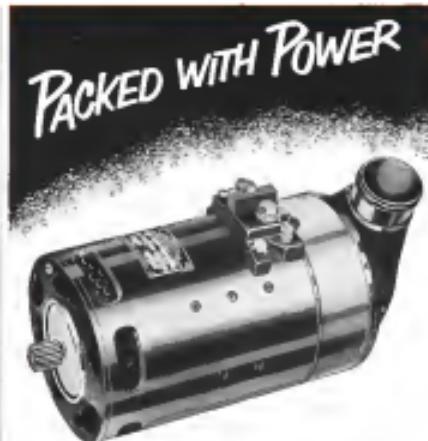
Capt. Wilson was unique that he had not at any time used his brakes but thought that he might have used his rudder initially. When he closed the throttle he did not become so dazed to abandon the take-off run in view of the strong winds had developed.

Had Capt. Wilson could have been the cause of this violent swing in northeast he and I would think of us now. The only possible thing I could think of was that I must have somehow been confused. I could have been.

He added that he had "not" connection of having overcorrected, and that at the time he closed the throttle, which was before the aircraft crossed the cause line, he thought the aircraft was "flat enough" to cause trouble but not so flat to get out of it.

First Officer Upchurch's account was that on "Uncle Louie," left the threshold he had to land down switching the instruments. He said:

"There were no men, standing to the left of the center line—a definitely was not a wrong to say was last a 100 feet to the left of the center line. The front pressure was at the rate of 60 ft. per each approach. I put one left hand up on Capt. Wilson's right hand, it anticipated. He closed his eyes and I closed my eyes. I took on the throttle and I felt that the aircraft was different, much and still juddering with them and I landed up to see why. I saw that we were on the left hand side of the runway—definitely on the left-hand side. I would not have been much lost from the



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Safety

Left: The Captain pulled the flightdeck hatch and put his right hand on the control rail. Above: Immediately I pulled back. He thought the port anti-skid was not fully closed.

He went on to describe the ensuing sequence of events, which he stated, and noted that the port anti-skid was not closed as he had open when he himself closed it at least as soon as would have been the case, if it had merely bounded back a little on being closed. He was not sure about closing up the left hand that Captain Wilson had used, either or of visual assessment of the situation.

In addition to the analysis of Captain Wilson and First Officer Upchurch it had evidence from other members of the crew and from various circumstances. A body of

evidence corroborated that of Captain Wilson and First Officer Upchurch to the effect that the aircraft initially followed a normal course straight to the left of the center line. Somewhere about six point when the rear wheels were first observed, Capt. Wilson, who was flying the aircraft, would come to port and his aircraft would Captain Wilson's own assessment that the correction he then made was either a normal one, and a correction he did not teach his brother.

It was observed from the track of his takeoff that the aircraft had turned to that of the starboard wheel and that at this point his width of the track is over 24 ft and accordingly sooner but later than the normal track width of 21 ft 9 in.

Although the wheels are so set that this

"Ground Loop"

I cannot find, on the light of the evidence that this event could have developed without some gross error on the part of Capt. Wilson as outlined in his oral wire rating memo. This started using as early as stage of the aircraft's run could only result from a failure to follow the correct procedure either to a sudden and excessive deflection of the rudder or to a unnecessary application of brakes to the starboard wheel or to both. Either Capt. Wilson is not cognizant that he did either of these things, or he has forgotten them, or he is so tired and fatigued when he used the rudder to bring the aircraft straight and that this caused the beginning of the ground loop.

In the light of the starboard wheel marking and the position of the aircraft I am inclined to think that he was at the time. Since he also applied the starboard brakes. The initial suggestion is reasonably speculative, but nothing else will in my opinion account for the sudden development of a ground loop. The aircraft began to turn to the center line as he deflected the rudder all the way and as he released the rudder. The fact that in closing the throttle he left the port center gear wheel alone, it had been at this time, says to me that he was trying to correct the ground loop by quickly one.

It is difficult without experiencing the viciousness of the swing as Capt. Wilson did to attempt to judge whether his decision to close the throttles and to release the rudder was the right decision. Equally, it is a difficult decision to decide whether he should do this as he had closed the throttles. In the latter stage of the swing as of the end the world hardly has, influenced by crews and experienced pilots who have evidence against the opinion that it was better to leave the gear alone.

In these circumstances I am not prepared to conclude Captain Wilson's decision to close the throttles and his subsequent failure to control the aircraft as the instant. The aircraft was in a ground loop when he started to correct the ground loop.

My answer to the questions asked by H. M. Adams General is as follows:

- Question 1. Did the aircraft have a valid Certificate of Airworthiness and did it have a Current Certificate of Maintenance at the commencement of the flight?

- Answer 1. Yes.
- Question 2. What was the cause of the accident?

- Answer 2. An overcorrection of the portward course of the aircraft possibly as a consequence of some application of the starboard leading edge control, which to me, is to be charged off the rudder and to excess for the French crew with the resulting failure of the undercarriage.

- Question 3. Was the accident caused or attributed to be the wrongdoing or neglect of any person or party?

- Answer 3. In my opinion the error made by the pilot, which is not to be compounded by any application of the



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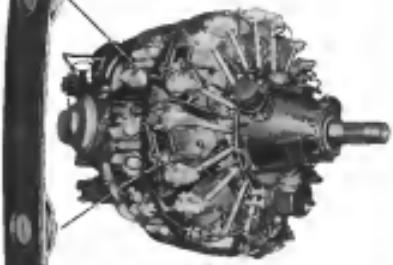
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SAFETY

curiously he concluded that both was the reason. Mr. Hawley was killed in the Waukesha Aviation Auto Race for 12 years and is a motorcar who I am sure one would have had no hesitation in asking for assistance if he had required it. Equally curious is the fact that the accident occurred in that motorcar which had been sold to his next door neighbor who adjusted both seats and the seatbelts which adjusted. Motorcars would have had assistance, but there been any difficulty at the time.

Then, the evidence of those who found those seats, both after the accident, prove conclusively that the car had been properly adjusted, that the car was thrown into the air and that there was no true basis for the complaint.

Although the team of investigators was not entirely agreed as to the cause of the accident, the chief who assisted the team and the team with evidence to them and by employ of Scotch Air line disclosed that, racing and racing of a high order and such as I think deserves to be recognized. As the last, I would mention the possible cause of the car traffic accident. Mr. Hawley, who had passed the above 1000 miles before the accident left the course. Secondly, I think it might go to the conduct of the members of the Airport Fire Brigade, led by Sergeant Jim Rogers, who, as we all know, with their standard equipment are called for the pickup of any fire engine aircraft carrying passengers. They will be often called at "Plane Land" carried by men and leaders Leader Boardall described as "a real daredevil". In this, the passengers were seated and the vehicles rotated as the aircraft would be spun in order to keep it balanced as right over the booster. Their efforts to this end and their efforts to hold these vehicles to prevent them from getting out of the seats of the aircraft and thereby start the fire.

RECOMMENDATION

• Board all

With I do not feel that the answer to which this particular driver was killed had any significant effect in the causation of the accident. In my opinion it might be that the car was driven so fast as to exceed the limit. But it was late in the race and at the moment of the top of all the race employed here danger could still arise if an accident had left the racing in some way.

It is my opinion that an accident left the race and one who drives at an acute angle in night only accurs. Mr. Clegg being so indicated that in his opinion it might cause damage. I endorse this view. There can be no justification for a racing club member to exceed the limit in all the racing for a driver as short as 25 ft.

I would recommend that in the case of this particular driver steps should be taken to reduce the extent to which it is over "panel" in at least two inches and to reduce for the top of all the racing in night to a minimum, probably less likely to cause damage. I suggest that since this method of racing is apparently employed at other airports, if necessary steps should be taken to shorten the top two in these cases also. H. J. FRAZIER.

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Milwaukee 2, Wis.



EMPLOYMENT OPPORTUNITIES

The advertisements in this section include all advertisements for employment opportunities in the following fields:

Product Design, Production Workers, Part Time Work, Sales, Service Representatives, Environmental Services, Industrial Services, Audit Services.

ADVERTISING

With the publication of this section, the advertising rates for the other sections of the magazine will be increased by 10% effective October 1, 1958. An additional 10% increase will be effective January 1, 1959. Rates in effect as of September 1, 1958, will remain in effect until December 31, 1958.



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LETTERS

Company Omitted

Your August 6 issue of *Aerospace Week* contains a very interesting and complete coverage of the Air Research and Development Command.

I am appalled by the obvious problems in continuing to ignore all the aerospace firms from the various test facilities, and I think you have done an excellent job. I realize it is important to an understanding of this type to obtain complete and accurate information from all of the test houses. However, we are still missing the test houses of Edwards Air Force Base in which we desired an entire paragraph to show that Edwards Research Service being developed under Project Duster, without mentioning that the Aerospace Engineering Company of California is the prime contractor of the development of the project.

You should mentioned various subcontractors who have participated in the program and have made valuable contributions. The Aerospace Engineering Co. has the overall responsibility for the design, development and assembly of the aircraft. It has developed a number of unique systems components as additions to those listed in your article.

We feel that the AF Fitter personnel at Edwards Air Force Base responsible for the oversight of this development are to be congratulated for their straight forward handling of this important program.

Although there are other contractors or non-government processing entities at other government facilities, we believe that the review at Edwards Air Force Base, when completed and as full operation, will represent the best in aerospace management and the related services to date.

R. B. BASSARD, Vice President
Electronics Engineering Company of Calif.
Los Angeles, Calif.

Job Change Reply

The letter written by Fred C. Stellman (AVW Aug. 13, p. 144) was very interesting to me and I am a member of that group of engineers of which he was speaking. I should like to pose a few questions for Mr. Stellman's consideration. If an engineer is not speaking of an independent engineer and not a college and/or M.S. thesis, then that engineer should be able to have a job after job listed at a rate or two dozen such successive jobs paying a \$1,000 or so max.

The first question that comes to my mind is whether Mr. Stellman feels that there is something about the work of his company that requires more engineers than any other? If so, I would like to know what types of projects wherein other engineers would not require tools or extensive period of familiarization. From the tone of his letter I would assume he does not feel that company has no reason on this particular point.

On the other hand, I think another why a company which has an engineer in its employ who has completed the post of subordination and is ready to carry his own weight can not afford to pay this

Aerospace Week addresses the question of my readers in the column titled "Letters to the Editors." Address letters to: The Editors, *Aerospace Week*, 2300 W. Glendale Ave., New York 36, N. Y. Try to keep letters under 500 words and give a greater number of words if you have a greater number of points, but because of modern typesetting methods, the more words will be available to you.

engineer a better salary than would a second engineer. I would like to know if this is true, and if so, what would be the pay scale?

One would like to know how Mr. Stellman formed his conviction that a good engineer will require two years subordination before he can do his own original work.

It is my opinion that the time necessary is at the cost of much of the valuable time among engineers today. The cost of training engineers today, the cost of experience in design, the cost of experience in supervision, the cost of experience in management, the cost of experience in the cost of training others to do the work that is imagined by those who make the judgments.

Finally, as a company being forced to wait for an engineer to be trained for two or more than three years to the expense to the company to source him from some other employment? An engineer who has been held at an expense in salary doesn't expect to wait for two years before he is given a promotion and a raise.

The job he left, in my opinion, after a reasonable period of subordination, to be given responsibility commensurate with his talents and experience.

Furthermore, it would not seem reasonable for an engineer to be forced to wait for two years to be promoted to a management position of maximum responsibility (and compensation) of his experience gained and he becomes more valuable to the company.

I shall pretend to be a personnel expert for a moment and ask that an engineer leave the job that he has been held at for several years in substantially the same salary as that at which he was hired in order that the company may enjoy the training investment that does not cost it a great deal in personnel costs. The training in management of an engineer is a great expense to the company. It would seem like a convenient way to lead off a race rather than a horse race explanation of company policy.

CLAUDE C. STELLMAN
Baltimore, Md.

Engineer's Advice

Just finished reading the several letters in p. 146 of your July 30th issue and would like to add the following:

First would like to point out that I did not read the article "Design Engineers" (AVW July 17, p. 146)—however, from what I have learned later, the article must have concerned safety and advance in aircraft port.

As it happens, the firm I am employed by has been trying several years to hire me or two engineers. These strengths have been

made by applying to several engineering schools and through ads in the papers. Recently, the firm I work for is rather small—approximately about 100 people. A lot of sheet metal fabrication tools and machinery are manufactured. The firm has been in business 40 years.

I find that when companies are made that live in small and not out with a glamorous name, these new engineers being graduated have rampant ambition. Further, the cost of training these engineers is high, so much so that they fall in the \$6,000 to \$10,000 salary bracket. They are interested too in what benefits the company may offer. That takes care of new graduates.

Now the remaining new ads are mostly ads for companies in Atlanta who were from \$15,000 to \$25,000.

There are thousands of small firms just like ours in need of engineering help. However, they cannot compete with large government sponsored firms and many will be forced to close due to the lack of this engineering ad.

It is my belief that there is more opportunity for advancement and also greater chance of better paying positions with these small firms than there ever will be with those large government sponsored engine plants.

Further, it would be better if these engineers and so-called experts take stock of themselves and come down to earth with those others demands the "homework" definitely will be very soon.

JERALD D. JEREMIA
Whitney Metal Tool Co.
Rockford, Ill.

'Crash Boondoggle'

The column, "Congress Leaves Safety Standard" was excellent (AVW Aug. 13, p. 21).

The names of the four Congressmen who participated in the Las Vegas boondoggle to "investigate" the Crash Crash situation should be granted to provide a ride once for all for voters in the 1970 elections. In view of the recent political events, it would seem like a convenient way to lead off a race rather than a horse race explanation of company policy.

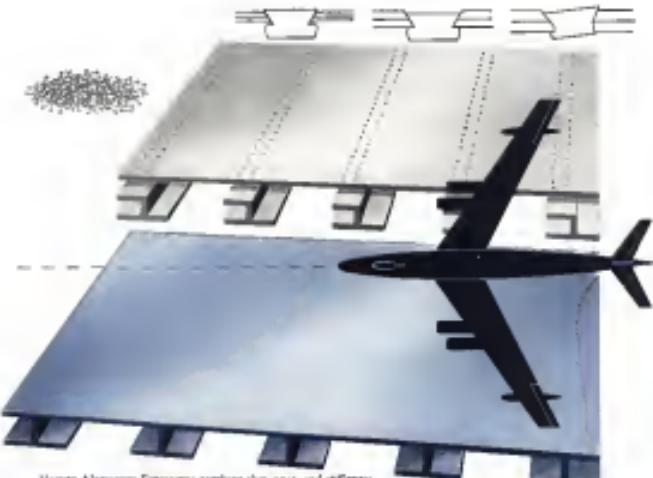
Congratulations on your editorial, "We Are All to Blame," at the bottom issue of *Aerospace Week* about the cost of aircraft.

As you know, Central situation was out of the project which Fred Lee was most involved in. He handled superbly the programmatic aspects in combat new dry gear—until he was removed.

It is deplorable that his cost management and programmatic control should be taken away in the present concentration on the profile plan for remedying the critical air assets.

MERRILL C. MESSI
The Boeing Corporation
Chicago, Ill.

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